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Subject: Request for Implementation Plan for
TTS and FGS

In accordance with the requirements of the above
reference, we are forwarding ten (10) copies of the following document:

<u>Title</u>	<u>Number and Date</u>
Program Plan for Multi-Satellite Augmentation Phase B-2	WDL-TR2024 18 January 1963

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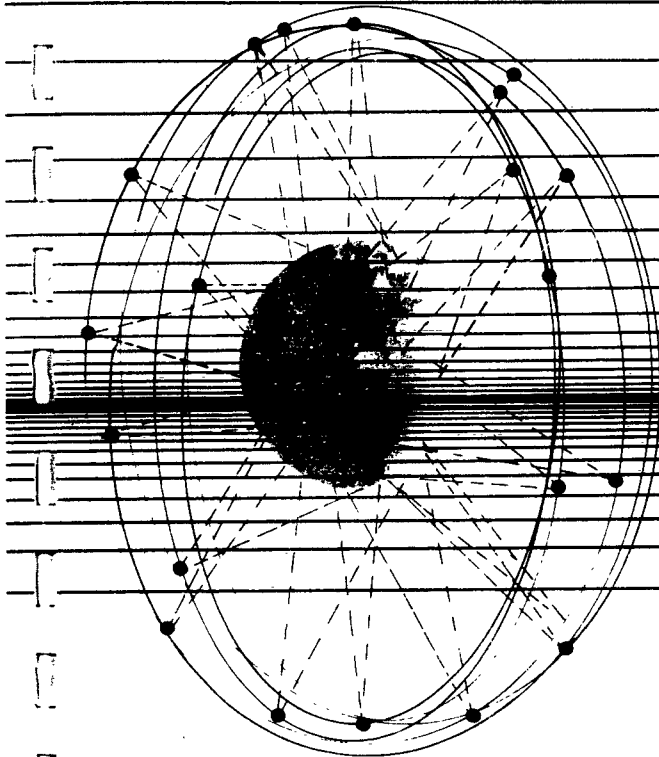
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297014

TECHNICAL OPERATING REPORT

WDL-TR2024

18 FEBRUARY 1963



**PROGRAM PLAN FOR MULTI-
SATELLITE AUGMENTATION
PHASE B-2**

PREPARED FOR:

AIR FORCE SPACE SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
INGLEWOOD, CALIFORNIA

L/C AF04(695) - 278

PHILCO

A SUBSIDIARY OF *Ford Motor Company*

**WESTERN DEVELOPMENT LABORATORIES
PALO ALTO, CALIFORNIA**

WDL-TR2024
18 February 1963

TECHNICAL OPERATING REPORT

**PROGRAM PLAN FOR MULTI-SATELLITE
AUGMENTATION, PHASE B-2
(FGS and TTS)**

Prepared by

**PHILCO CORPORATION
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L/C AF04(695)-278

Prepared for

**SPACE SYSTEMS DIVISION
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UNITED STATES AIR FORCE
Inglewood, California**

PHILCO

WESTERN DEVELOPMENT LABORATORIES

ABSTRACT

PHILCO WDL-TR2024
PROGRAM PLAN FOR
MULTI-SATELLITE AUGMENTATION
PHASE B-2
18 February 1963

UNCLASSIFIED

150 pages
L/C AF04(695)-278

This report describes Philco WDL's plan to implement Phase B-2 of the Multi-Satellite Augmentation Program. The document includes an implementation plan, a general test plan, an activation plan, specifications, schedules, definitions of equipment interfaces, new major equipment, site facilities requirements, a communications requirements plan, and Government furnished property and services.

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PHILCO

WESTERN DEVELOPMENT LABORATORIES

FOREWORD

This Technical Operating Report was prepared by Philco Western Development Laboratories in fulfilling the requirements of SSOCD TWX No. 28-12-35, dated 28 December 1962, subject Request for implementation plan for TTS and FGS.

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REPORT DIVISION

This Program Plan for MUSAP Phase B-2 at the Fort Greely and Thule Tracking stations (FGS and TTS) is a compilation of 10 sections, as follows:

- Section 1 (Overall Implementation Plan) describes the objectives and proposed preliminary planning for the implementation of the Multi-Satellite Augmentation (MUSAP) Phase B-2 Program.
- Section 2 (Program Test Plan) outlines the types of tests to be performed during the Phase B-2 program, including component and equipment tests, acceptance tests, and installation and checkout tests through Phase IV.
- Section 3 (Activation Plan) contains a narrative description of the preliminary planning and schedules for the Installation and Checkout of the various equipment and subsystems through Phase IV at FGS and ITS.
- Section 4 (Program Specifications - Documentation) contains a listing of the applicable subsystem and equipment performance and acceptance tests which reflect the applicable GSETD design criteria.
- Section 5 (Integrated Subsystem Equipment Delivery Schedules) includes the equipment schedules for the applicable subsystems covering the phases of planning, design, procurement, fabrication, assembly, test and delivery.
- Section 6 (Definition of Interfaces with MUSAF Phase A and Existing Equipment) includes preliminary system block diagrams indicating the scope of the interface with existing and MUSAP-Phase A equipment at FGS and ITS.

- Section 7 (New or Modified Major Equipment) includes a preliminary list of the equipment to be modified or supplied under each of the applicable subsystems at FGS and TTS. Items to be reactivated will also be listed.
- Section 8 (Site Facilities Requirements) describes site facilities required for the FGS and TTS stations and includes additional A&E criteria for the various rooms within the several buildings, installation engineering considerations, proposed means for siting the 150-mc (VHF) antenna, 375/400-mc boresight tower and associated equipment and planned equipment layouts.
- Section 9 (Preliminary Communications Requirements Plan) includes a list of major hardware, preliminary schedules and an interface explanation for the intrastation communications subsystem at FGS and TTS.
- Station 10 (Government Furnished Property and Services) describes the use of such Government Furnished Property and Services as will be provided during the period covered by the applicable contract. A preliminary list of required GFP equipment will be developed at a later date.

SECTION 1
OVERALL IMPLEMENTATION PLAN

SECTION 1

OVERALL IMPLEMENTATION PLAN

1.1 PROGRAM OBJECTIVES

This implementation plan is submitted by Philco WDL for the rehabilitation and modification of existing equipment at Thule Tracking Station (TTS) and Fort Greely Tracking Station (FGS), and for the addition of new equipment required to satisfy applicable SSD approved subsystem specifications. Applicable SSD approved ASCO design criteria will be used as a guide. This plan is based upon the most current available information, including data from Philco WDL operating station personnel.

The efforts involved in this plan will provide for further implementation of Satellite Control Facilities at TTS and FGS.

Upon approval of this program, Philco WDL will initiate the required efforts and will be responsible for its completion through Phase III (development effort by Associate Contractor) and Phase IV (integrated subsystem tests under overall technical guidance of Integrating Contractor).

1.2 PROPOSED IMPLEMENTATION PROGRAM

1.2.1 General

The contractor-proposed plan contained in the following sections of this document delineates the development, procurement, fabrication, installation, checkout and documentation of new and/or modified existing equipment for the following subsystems at TTS and FGS. The estimated degree of effort is indicated. An asterisk (*) indicates partial or new additions to MUSAP-Phase A and/or existing subsystems.

Thule Tracking Station

1. Quad-helix telemetry and ground subsystem incorporating 400-mc (VHF) command subsystem*

2. Data handling subsystem*
3. Timing *
4. 150-Mc (VHF) antenna subsystem (complete-new)
5. FM/FM telemetry subsystem*
6. Minor modifications involving the following MUSAP-Phase A and/or existing subsystems:
 - Control and display
 - Checkout
 - Intrastation communication
 - Boresight (exact degree of modifications to be determined at an early date).

Fort Greely Tracking Station

1. Multipurpose VHF/UHF telemetry, tracking, command and data receiving subsystem (60-Ft. TT&C) *
2. Data handling subsystem *
3. 150-Mc (VHF) antenna subsystem (complete-new)
4. Timing *
5. FM/FM telemetry subsystem *
6. Boresight equipment*
7. Minor modifications involving the following subsystems:

- Control and display
- Checkout
- Intrastation communication .

This plan includes a list of all major hardware required for each station, as well as preliminary planning describing how the equipment will be interfaced with existing or new equipment. Facilities requirements and siting consideration for the 400-mc boresight tower (FGS) and the 150-mc command antenna and associated equipment (FGS and TTS) are also provided. Revisions of the current intrastation communications plan for TTS and FGS include lists of required hardware and an interface explanation indicating the required integration with existing or new equipment.

1.2.2 Preliminary General Plans and Basic Assumptions

The general plans and engineering ground rules which will be employed during the course of this development, installation and checkout will include the following:

1. On-site work that will interfere with the existing portion of the TTS and FGS station will not start until at least 30 days following the end of the successful completion of Phase V of MUSAP-Phase A, and under no circumstance until an official go-ahead is granted by AFSSD (SSOC).
2. All work that is required to complete the reconfiguration of TTS and FGS will be accomplished during this effort under the MUSAP Phase B-2 program. This includes removal of all excess equipment (TTS only) and storage at a Government designated storage area. The lists presented below are preliminary at this time and will be expanded in detail during the program.

3. Provide command logic equipment at both stations to program VHF/UHF commands via MUSAP facilities. This involves modification kits which will be supplied, installed and checked out in both Phase A and Phase B-2 equipment to handle the additional command system involving the control of the 150-mc and 400-mc command subsystems. This will include interfacing the 150-mc and 400-mc command equipment with the MUSAP-Phase A data handling subsystem when requirements are defined by AFSSD/Aerospace.

1.2.3 Preliminary Specific Plans

The specific equipment to be removed, stored, furnished and/or modified, installed and tested is indicated below for the two applicable tracking stations.

Thule Tracking Station (TTS)

1. Equipment and Vans to be Removed

- a. Verlort Radar. Remove van and all contents, antenna, pedestal and all external equipment including three phase delta power transformers. Remove Verlort bore-sight boards, if not required by Prelort radar. Remove all cables associated with Verlort van except coaxial and control cables going to the Verlort boresight tower. These cables should be stubbed off for future use. Leave radome and heating intact. The portions of the GE 703 test set will be retained.
- b. Milgo Data Van. Remove van and all contents. Remove all cables associated with data van.
- c. Administration and Control Van. Remove van and all contents. Remove all cables associated with van.

- d. Telemetry Van. Remove van and all contents, except for those portions of GE 703 test set. Remove all cables associated with van.
 - e. Instrumentation Van. Remove van and all contents except Cabinet OA-184 (quad-helix antenna control) and communications control panel from Cabinet OA-185 (amplifier, public address). Remove all cables except those from quad-helix to van (these may be used in modifying quad-helix to 400 mc).
 - f. Junction Boxes and Cables. Remove all junction boxes and cables not required by MUSAP.
 - g. VHF Telemetry Receiving Capability. Remove VHF (225-260 mc) telemetry receiving capability from the quad-helix array. However, the existing helical 200-mc antennas and associated transmission lines on the quad-helix pedestal (for the VHF telemetry reception) will be retained to insure proper mechanical balancing of the antenna array. Removing the 200-mc helics will upset the moment about the rotational axis, thus requiring additional counterbalancing devices. Previous tests [on the Annette Tracking Station (ATS) 400 mc - 200 mc quad-helix array] indicate that no undesirable mutual coupling effects will result by retaining the deactivated 200-mc helical antennas (on the quad-helix array) with the active 400-mc helices.
2. Equipment to be Furnished and/or Modified, Installed and Tested
- a. 400-Mc Quad-Helix Telemetry and Command Subsystem. Modify the existing quad-helix tracking antenna subsystem

to provide for 400-mc command, reception and slaving capabilities. This will require the following detailed efforts:

- Install 400-mc helices. Refer to Para. 1.2.3(1) (g) above.
- Add 400-mc Doppler, 256 bps telemetry data reception and command capabilities which are compatible with requirements of Programs 823 and 626. (One transmitter required.)
- Relocate quad-helix antenna control cabinet (OA-184) from instrumentation van to Room 108 of Bldg. S-1824.

NOTE: This cabinet contains equipment other than those for antenna control. Only the antenna position indicator panel and antenna position control panel are required. Remaining equipment within the rack should be removed and blank panels substituted. The REMANCO communication control panel previously removed from Cabinet OA-185 should be located within the quad-helix antenna control cabinet (OA-184). (Alternate approach: Reserve approximately 23 inches of rack space in Doppler/command equipment racks for antenna control and indicator panels.)

- Locate Doppler data converter in vicinity of RDT associated with 200-mc auto tracking antenna and add two more input cards to this RDT to accept Doppler word and status work, i.e. (1) Doppler range rate, (2) Doppler and command status bits, and quality bit for Doppler.
 - Provide time display and status control units if antenna control and Doppler are not in visual range of an existing time display unit.
- b. 150-Mc VHF Antenna Subsystem. Provide a 150-mc VHF command capability, involving the following efforts:

- Locate new 150-mc command antenna inside Verlorr radome (26-1/2-ft.)

NOTE: Consideration will be given to the use of a 19-ft TACO dish and pedestal. However, for the purpose of this Program Plan, the current Yagi-type antenna (as at VTS and NHS) will be initially selected until more information is obtained concerning additional dimensional data for the parabolic antenna.

- Locate new VHF transmitter inside Room 113 of Bldg. S-1824.
 - New antenna control and command verification and tone generator cabinets to be located inside building as determined by space requirements.
 - 150-Mc transmitter power output to be a nominal 1 kw.
- NOTE: Two transmitters, switch selectable, will be required per program requirements.
- Tone generators (part of command verification and tone generator cabinets), to support Zeke and Zombie command requirements.

c. Data Handling Subsystem. Modify command logic equipment to provide VHF and UHF (400 mc) command capabilities via MUSAP command facilities.

d. Control and Display Subsystem. Modify SOC to provide additional command capabilities as required to implement (c) above.

e. Checkout Subsystem

- Modify checkout program board assembly to permit switching of antenna dummy loads of 150-mc and quad-helix antennas.
- Modification kits for Programs 823 and 626.

- f. Intrastation Communication. Doppler VHF commanding and antenna control for quad-helix and VHF command antennas should be provided with, or have access to, communication panels or jack boxes for operational voice intercomm nets.
- g. Boresight Equipment
- Investigate the adequacy of the existing boresight equipment to support the remaining antenna subsystems after completion of MUSAP Phase B-2 efforts.
 - Based upon this preliminary investigation, propose the rehabilitation, modification and relocation, as required, of existing boresight equipment and provide, install and check out new equipment where necessary.
- h. FM/FM Telemetry Subsystem
- Add VHF command verification capability to existing FM/FM telemetry subsystem
- i. Timing Subsystem. Provide the required amounts of time display indicators, station status control units and time display distributors associated with the 150-mc (VHF) antenna command and quad-helix T and C subsystems.

Fort Greely Tracking Station (FGS)

1. Equipment Removal. No equipment existing for the support of Program 461 is to be removed. No alterations are to be made to the station which would prevent the return of the station to Program 461 support requirements in a short time period (several days).

2. Equipment to be Furnished and/or Modified, Installed and Tested

a. Multipurpose TT&C 60-Ft. Antenna Subsystem

- Reactivation. Reactivate existing 60-ft. TT&C antenna and associated equipment indicated below. This includes (1) Replacing all previously "cannibalized" items on the 60-ft. antenna, and (2) completing the required provisioning of spares for the 60-ft. antenna.
- 2-Gc Autotrack/Narrow Band Data Reception. Complete 2-gc autotrack/narrow-band data reception capabilities. This includes the modification of existing facilities to provide capability and characteristics compatible with Program 823 modification at NHS and VTS. (No requirements exist at this time for the inclusion of the UHF wide-band data reception capability.)
- Phase III Tests. Complete all necessary Phase III verification and/or acceptance tests that were not completed prior to station deactivation. Perform tests as necessary to demonstrate proper operation of existing equipment.
- 400-Mc Tracking, Telemetry and Command (TT&C) Capability
 - (1) Provide 400-mc autotrack capability.
 - (2) Provide 375-mc transmit capability compatible with the Program 823 modifications at NHS and VTS.
 - (3) Provide Doppler processing, telemetry reception, and command capability compatible with the Program 823 capability at NHS and VTS.
- 200-Mc Data Reception
 - (1) Verify/modify capability of 200-mc feed, preamp, filters, etc., to provide a 225-260 mc signal to MUSAP-Phase A furnished (GFE) line driver.

- (2) Install MUSAP-Phase A furnished (GFE) line driver to provide preamplified 225-260 mc signal to FM/FM telemetry ground station.

- Synchro Links (Control and Display Subsystem)

- (1) Install MUSAP-Phase A provided 3:2 axis converter in intermediate servo assembly.
- (2) Install necessary equipment to provide one speed synchro slaving of the T&D antenna.
- (3) Install necessary equipment to transfer parallel encoder outputs to the MUSAP-Phase A remote digital data link equipment. (Part of data handling S/S)

- Digital Data Links (Data Handling Subsystem). Provide remote digital terminal equipment (RDTE) capable of accepting the following data: (also see Para. c below)

- (1) Antenna encoders (Refer to Para. (3) above)
- (2) Doppler
- (3) Status.

NOTE: RDTE equipment is furnished under MUSAP-Phase A.

- Station Status Displays (Timing Subsystem). Provide one station status control unit. Existing 117L status display units will be modified as required on site. (See Para. e below)
- Timing Subsystem (WDL 117L-Type). Connect existing coaxial cable from time code word accumulator in DAP building to remote timing and data distribution equipment (RTDD) in T&D building. This will allow displaying WDL 117L system time (in total seconds) in existing time display units without using digital data transceiver units.
- Timing Subsystem (MUSAP-Phase A Type). Connect 1-kc modulated STCW to remote digital terminal unit. (also see Para. e below)

b. 150-Mc VHF Antenna Subsystem

- Provide VHF transmitter (1 kw) exciter modulator command (echo check) detector tone generators, capable of supporting ZEKE II and ZOMBI requirements.

NOTE: Two transmitters and exciters, switch selectable, will be required per program requirements.

- Provide antenna capable of handling 1-kw power at approximately 150-mc and of a physical size to allow mounting in a 26 1/2-ft. radome. The antenna is to be provided with one speed control transformer synchro inputs for both axis and also be capable of positioning from remotely located control panel.

NOTE: Consideration should be given to the use of a 19-ft. TACO dish and pedestal. However, for the purpose of this Program Plan, a Yagi antenna (similar to that at VTS and HTS) will be selected until additional dimensional data is obtained for the parabolic antenna.

- Provide a 26 1/2-ft. heated radome for antenna and pedestal.

c. Data Handling Subsystem. Modify MUSAP-Phase A data handling to provide VHF and UHF (400 mc) command capability. Also see Para. (f) below and 2 a above.d. Control and Display Subsystem. Modify SOC to allow command mode selection for VHF command. (Refer to Para. 2 a above)e. Timing Subsystem

- Timing - MUSAP Type. Provide timing display unit at VHF antenna control. Inputs are acquired from radar TDD and station status control units (assuming that VHF antenna and control will be located in command transmitting building near radar). (Refer to Para. 2 a above)

f. FM/FM Telemetry and Data Handling Subsystem

- Interface existing GP-1 to MUSAP FM/FM telemetry patch panel and telemetry data processor.
- Provide VHF Command verification capability at FM/FM telemetry ground stations.

g. Checkout Subsystem

- Modify checkout program board assembly to permit switching of antenna dummy loads of 150-mc and 375-mc antennas.
- Modification kits for Programs 823 and 626.

h. Intrastation Communications

- Provide communications panel and/or jack box at 2-kmc antenna control, Doppler equipment and VHF antenna control connected to MUSAP operational voice network.
- Provide public address (PA) speakers (amplifiers if required) connected to MUSAP PA network, at T&D building and vicinity of VHF antenna control.

i. Boresight Equipment (General)

- Investigate the adequacy of the existing boresight equipment to support the remaining antenna subsystems after completion of MUSAP Phase B-2 efforts.
- Based upon this preliminary investigation, propose the rehabilitation, modification and relocation, as required, of existing boresight equipment and provide, install and checkout new equipment where necessary.

j. Boresight Equipment for 60-Ft. TT&C Antenna at FGS

- General. The boresight equipment installed at the time of the deactivation was in the interim configuration. The equipment for the final configuration was at Philco WDL and is currently in storage. The addition of the 375/400-mc capability will require the installation of suitable boresighting equipment on a near-field tower. (The current near-field tower is too near and too low to permit sighting for 400 mc.)
- 375/400-mc Boresight Configuration. The addition of the 375/400-mc capability will require the installation of a near-field tower to a point 2,000 feet from the T&D antenna. To maintain the optimum sighting angle, a new taller tower is needed. (Initial estimates indicate a required height of 350 feet.) The VHF and UHF antennas on the existing near-field tower will be moved to the new tower; the balance of the existing near-field equipment such as target boards and diplexers are unusable at the new location.)
- VHF/UHF Boresight Configuration (200 Mc, 2 Gc). The interim OA-53, OA-54 and OA-55 racks will be removed and replaced by the final racks. Some of the equipment chassis in the interim racks are in final form and these will be transferred to the final racks. This will complete the effort originally scheduled for this subsystem.

- k. Interconnection/Interface Requirements. All equipment described shall become a part of the MUSAP configuration and will be integrated within MUSAP as shown on the system block diagram for FGS (MUSAP Phase B-2); see Section 6.

SECTION 2

MUSAP PHASE B-2 PROGRAM TEST PLAN

SECTION 2

MUSAP PHASE B-2 PROGRAM TEST PLAN

2.1 INTRODUCTION

2.1.1 Purpose

This plan outlines documentation requirements, establishes responsibilities for conducting and witnessing tests, and evaluates requirements for MUSAP Phase B-2. The plan also outlines the types and preferred sequence of tests of Phase B-2 new, rehabilitated and modified equipment at Thule Tracking Station (TTS) and Fort Greely Tracking Station (FGS). Tests through Phase IV, as specified in this plan, apply to components and subsystems.

2.1.2 Description

The MUSAP Phase B-2 equipment configuration is based on individual requirements at each site. The following is a list of new, rehabilitated or modified (major or minor) equipment or subsystems, and the applicable sites.

<u>Equipment</u>	<u>Site</u>
• VHF Command (150 mc) (New)	TTS, FGS
• Quad-Helix Telemetry and Command (Major)	TTS
• 60-ft. TT&C Antenna (Major)	FGS
• Control and Display (Minor)	TTS, FGS
• Timing (Major)	TTS, FGS
• Data Handling (Major)	TTS, FGS
• Checkout (Minor)	TTS, FGS
• Intrastation Communication (Minor)	TTS, FGS
• Boresight Equipment	TTS, FGS
• FM/FM Telemetry (Phase A) (Major)	TTS, FGS

2.1.3 Objectives

The tests specified in this plan will be conducted to verify and demonstrate that the new subsystems and rehabilitated or modified equipment and subsystem, covered by this program, meet the requirements of the applicable subsystem specifications and revisions.

2.1.4 Test Philosophy

For the purpose of this plan, tests required to accomplish the objectives of this program have been categorized into component and equipment testing, subsystem acceptance testing, and Phase I through Phase IV testing.

Component and Equipment Testing

1. Receiving Inspection. Tests of incoming components and raw material will consist of an identification of material by comparing its properties or attributes with documented requirements as reflected in specification control drawings, purchase specifications, vendor specifications, or purchase order descriptions. Visual and mechanical tests will be performed to assure that quality of finishes, dimensions, materials, and mechanical functions comply with documented requirements.

Electrical tests, where applicable, will be performed to assure that electrical quality and characteristics comply with documented requirements.

Records will be maintained to show:

- Tests performed
- Test conditions
- Test results
- Compliance or noncompliance

- Disposition of tested items
- Test instrument calibration status
- Pertinent test procedures (references to WDL QA manual)
- Material trouble and failure reports.

2. Tests of Purchased Equipment. Material will be identified by nomenclature, model, serial number and manufacturer, and compared with documented requirements.

Visual and mechanical tests of the equipment will be performed to assure freedom from defects and shipping damage, and to determine that finishes, dimensions and materials meet requirements of the specifications against which the equipment was purchased. Tests will be performed to verify that equipment performance is within equipment specifications, or vendor data sheets which may be accepted in lieu of these tests upon approval by the Philco WDL product assurance.

Environmental tests for performance under conditions of abnormal temperatures, vibration or mechanical shock will be performed when the need for such testing is specified.

Records will be maintained to show:

- Tests performed
- Test conditions
- Test results
- Compliance or noncompliance
- Disposition of tested items
- Test instrument calibration status
- Pertinent test procedures (references to WDL QA manual).

3. Developmental Tests of Engineering Models. Electrical bench tests will be performed to determine whether the equipment complies with the performance goals established in the equipment specifications.

Temperature tests will be performed, as required, to assure that the equipment will meet its performance goals under abnormal temperature conditions.

Engineering models and prototypes of final design will be submitted to vibration, shock and other pertinent mechanical tests to assure that they will withstand shipping and operating stresses safely.

4. Fabrication Tests. Fabricated material will be inspected to prints to assure that correct materials, dimensions and finishes have been used, as well as to assure excellence of craftsmanship.

Electrical continuity tests, where applicable, will be performed to verify wiring accuracy and disclose gross defects prior to functional testing.

Functional tests at unit level, covering electrical and mechanical operation of the equipment, will be performed on each piece of equipment at unit level. Whenever possible, these tests will include criteria pertinent to acceptance tests of completed equipment. However, it is recognized that many unit level equipment items require support of other equipment at the same level if the acceptance test requirements are to be met, and that it is often more economical to apply acceptance test criteria during group level tests.

Functional tests at group level will be performed on each group of mutually supporting units that is capable of normal operation without the support of other equipment.

Records will be maintained to show:

- Tests performed
- Test conditions
- Test results
- Retests if performed
- List of test equipment used, with calibration dates.

Acceptance Tests

1. Equipment Acceptance Tests. Acceptance tests to be performed on equipment, as required by the acceptance test specification, will be performed following successful completion of the functional tests outlined in "Fabrication Tests" above.
2. Subsystem Acceptance Tests. Acceptance tests performed on complete new subsystems will be conducted in accordance with the criteria contained in the applicable subsystem specification. In the event that new subsystem acceptance tests are not completed before shipment because of the necessity to integrate items with other site-located equipment or subsystems, the remaining portions of the acceptance tests will be completed on site during Phase III.

Records will be maintained to show the following:

- Test performed
- Test conditions
- Test results
- Lists of test equipment used including calibration dates.

Copies of the subsystem acceptance test data sheets will accompany each subsystem to its destination, and other copies will be forwarded to the destination through routine channels.

Phase I and II Tests. Incoming inspection of items delivered to the sites will follow the procedures outlined in Para. 2.1.4(1), "Receiving Inspection." Installation tests and inspection will be performed on site to assure correct assembly and wiring of every new subsystem to be activated. These will include, but will not be limited to, wiring continuity and mechanical tests for correctness of assembly and workmanship.

Turn on tests will be performed to determine if the equipment is in good operating condition and that it is not degraded by shipment, handling and installation. The installation contractor is responsible for providing the installation test documents. Completion of the installation test will be witnessed and signed off by the WDL product assurance representative, the installation supervisor and the technical control supervisor.

Phase III Tests. Acceptance tests or portions not completed at the vendor's or contractor's plant for reasons indicated above will be completed on-site during Phase III, in addition to the tests specified in the normal Phase III procedures.

The Phase III checkout is verification of all signal and control functions of the MUSAP equipment. It includes the tie-in of command and control and special equipment of other subsystems that are required to validate the characteristics of the subsystem under test. This checkout will be accomplished in accordance with Phase III procedures prepared by Philco WDL. Philco WDL is responsible for successful completion of this phase. Sign off of all data sheets by officially designated witnesses is required prior to the starting of Phase IV. The R&D effort for the associate contractor is concluded when Phase III is finished.

Phase IV Tests. During Phase IV, the combined station equipment/subsystem are integrated and validated. This includes satisfactory tests and demonstrations of overall station hardware and computer program operation including that involved in the tracking station to STA link.

The validation will be accomplished while using complete SSD approved acceptance test plans and acceptance test procedures provided by the station integration contractor. The tests will be performed by station/STA operation and maintenance personnel. These tests will be conducted under the technical supervision of the appropriate associate contractor and with the station integration contractor providing the overall technical guidance.

Action on the resolution of equipment/subsystem incompatibilities that arise during Phase IV is to be initiated, and the incompatibilities are to be resolved by the integration contractor.

Before Phase IV is completed, a successful demonstration to the group led by the senior on-site 6594th ATW representative, as required by Exhibit 62-153, will be accomplished and the other items specified in that exhibit will be delivered or accounted for. Completion of Phase IV is a discreet event that is a necessary prerequisite to the start of Phase V.

Complete transition of responsibility also occurs during Phase IV. The R&D effort, under the direction of the AFSSD/Space Vehicle Office is concluded and the test operational responsibility of the 6594th ATW is fully assumed when this phase is finished. At this point, the equipment/subsystem and computer programs are accepted.

Test Responsibility. A WDL test supervisor will be responsible for conducting Phase III and Phase IV tests. He will have the authority to substitute test equipment or simulation equipment when necessary and

to change test procedures or substitute new procedures with the concurrence of official witnesses. The test supervisor will be responsible for insuring that all test results are properly documented and that WDL Form 151, "Trouble and Failure Report," is completed for any component, equipment or subsystem that fails or with which trouble is encountered.

Test Witnesses. Subsystem acceptance tests, Phase III, and Phase IV tests will be witnessed by the following or their alternate so designated:

- Philco WDL Product Assurance Representative
- Air Force QC Representative
- AFSSD Representative
- Aerospace Satellite Control Office Representative
- Integrating Contractor Representative.

The Philco WDL product assurance representative will witness all tests. Other officially designated witnesses will be notified in advance of a scheduled test. Signatures of all official witnesses (a minimum list to be furnished by AFSSD) present during the test will constitute complete official witnessing. In addition to test witnesses signatures, the data sheets will be signed by the Philco WDL test supervisor.

2.2 APPLICABLE DOCUMENTS

All documents listed are considered compliance documents except when otherwise noted.

2.2.1 General

SSD Exhibit 62-153, SCF Acceptance Procedure, will be used as a compliance document.

2.2.2 Military Specifications

1. AFSCM 375-1, "Configuration Management During the Acquisition Phase," dated 1 June 1962. (Exhibits II, III, IV, V, VIII, and IX, and AFSCM 375-1A, dated 10 August 1962).
2. MIL-E-4158B, "Electronic Equipment, Ground, General Requirements for" (Guide).
3. MIL-I-26600, "Interference Control Requirements, Aeronautical Equipment" (Guide).
4. MIL-Q-9858, "Quality Control System Requirements."
5. Bulletin No. 520 (USAF), "Calibration and Certification of Measuring and Testing Equipment."
6. MIL-STD-803, "Human Engineering Criteria."
7. MIL-M-26512B, "Maintainability Requirements for Aerospace System and Equipment."

2.2.3 Philco WDL Documents

1. Subsystem Specifications. Applicable specifications will be supplied at a later date (see Section 4).
2. Technical Reports. Applicable Technical Reports will be supplied at a later date.

2.3 TESTING REQUIREMENTS

2.3.1 Subsystem Testing

The general subsystem acceptance test will include the testing of pertinent specification parameters listed in the subsystem performance

specification. A subsystem acceptance test requirement, which will be a portion of the subsystem specification for applicable subsystems, will be submitted to AFSSD for approval 30 days before the scheduling of the subsystem acceptance test. The acceptance test requirements will: Define the parameters and give the tolerance of the specified parameters to be tested; provide a block diagram; list the necessary test and simulation equipment; and explain, if necessary, how the test will accomplish the intended purpose. Detailed test procedures will be available for the purpose of conducting acceptance tests.

2.3.2 New Subsystems (VHF Command, 150 Mc (FGS and TTS))

The VHF command subsystem will be subjected to acceptance testing according to the requirements specified in the applicable sections of approved design specification. The subsystem acceptance test will be conducted in-house or at a vendor, consistent with logistics and scheduling requirements.

Phase I through IV operations and tests will be conducted on-site. Detailed procedures for testing during Phase III will include those sections of the acceptance tests required to demonstrate proper performance of the subsystem.

Phase IV procedures will include sufficient detail on interfaces, compatibility requirements, and integration with existing equipment to demonstrate station operational readiness.

Procedures in support of the various subsystem testing phases will be approved as designated in contractual requirements, and supplied according to the dates indicated in the master schedules.

2.3.3 Major Modifications

Components or equipment procured or fabricated for the purpose of modification will be subjected to component and equipment testing as outlined in Para. 2.1.4 above.

Phase III and Phase IV operations and tests will be conducted on site for rehabilitated or major modified subsystems. Detailed procedures for testing will demonstrate compliance with those sections of approved design specification that define the subsystem performance requirements.

Phase IV procedures will include sufficient details on interfaces, compatibility, and integration to bring the equipment up to a state of operational readiness with existing equipment.

The procedures will be approved as designated in contractual requirements, and supplied as dictated by the master schedule.

The following is a list of equipment or subsystems in this category:

- | | |
|------------------------------------|-----------|
| ● Quad-Helix Telemetry and Command | TTS |
| ● 60-Ft. TT&C Antenna | FGS |
| ● Timing | TTS, FGS |
| ● Data Handling | TTS, FGS |
| ● FM/FM Telemetry (Phase A) | TTS, FGS. |

2.3.4 Minor Modifications

Components or equipment procured or fabricated for the purpose of modification will be subjected to component and equipment testing as outlined in Para. 2.1.4 above.

Proper functional operation of all modified equipment will be verified prior to Phase IV testing.

The following is a list of equipment and subsystems in this category:

- | | |
|-----------------------|----------|
| ● Control and Display | TTS, FGS |
|-----------------------|----------|

- | | |
|------------------------------|----------|
| • Checkout | TTS, FGS |
| • Intrastation Communication | TTS, FGS |

2.4 ANALYSIS AND EVALUATION

Results of Phase III tests will consist of a copy of the Phase III test procedures and the completed and signed data sheets. WDL Form 151, "Trouble and Failure Report," for each failure or trouble encountered will become a part of the Phase III test procedures.

2.4.1 Final Test Report

A final test report will be written which will contain all Phase IV test results and evaluations. The test report will show all troubles and failures encountered. In case of deviation from the test procedures, the actual test procedure used shall be provided. All recordings and print-outs shall be a portion of the report.

2.4.2 Subsystem Test Data Book

A subsystem test data book will be compiled for each subsystem. This test data book is intended for use by the station personnel for the maintenance of the applicable subsystem. It will contain a history of the MUSAP Phase B-2 equipment showing all test data, wire lists and calibration and repairs. The test data will consist of:

1. Multi-Satellite Augmentation Program description including station block diagrams
2. Program specification tree

3. Subsystem specification and acceptance test (including completed data sheets)
4. Detailed subsystem equipment list
5. Phase III test procedures (including completed data sheets)
6. Phase IV test procedures (including completed data sheets)
7. Equipment acceptance tests (including completed data sheets)
8. Subsystem wire list
9. Installations wire list
10. Field modification record
11. Subsystem configuration change record
12. Subsystem equipment calibration, preventative maintenance, repair and overhaul schedule/log
13. Publications record.

SECTION 3
ACTIVATION PLAN

SECTION 3 ACTIVATION PLAN

3.1 GENERAL

The proposed plan for activation of MUSAP Phase B-2, Phases I-IV, at FGS and TTS is described below. The planning schedules in Figs. 3-1 and 3-2 are for definition of effort and time spans only, and are not to be construed as final or total implementation schedules (based on a 40-hour week). For planning purposes, the "beneficial occupancy date" (BOD) may be assumed to occur approximately 13 weeks after 1 July 1963 to permit preliminary procurement of installation materials and negotiation of subcontracts for site preparation, as required.

3.2 SITE ACTIVATION

Site activation is described initially by those tasks, functions, or assumptions common to both sites. The detailed task for each site is separately described in Para. 3.2.5 and 3.2.6.

3.2.1 Ground Rules

1. Continuous full access to all equipment and work areas during activation.
2. Relocation, modification and interface schedules predicted on noninterference, full access basis; this implies down time, when required.
3. Government furnished transportation, packaging and storage will be provided for all removed equipment (TTS only).
4. Communication interface to be accomplished by subcontract.
5. Subcontract personnel will be used to accomplish building preparation and construction tasks under Philco supervision.
6. Based upon previous experience, the schedules indicated in Figs. 3-1 and 3-2 are dependent upon existing weather conditions at the respective sites.

7. Philco engineering and technical personnel will accomplish removal, relocation, installation and checkout tasks.

3.2.2 Building Preparation

Assuming minimum down time, building preparation, installation, and relocation tasks will start concurrently and overlap to the maximum extent. Based on prior experience, maximum use will be made of earliest good weather periods for outside installation work at both stations (boresight and 150-mc equipment).

3.2.3 Phase III Activities

Upon completion of the installation of each subsystem, a Phase III checkout will be performed. In instances where modification of a function is involved, a functional test of the modification will be performed. All tests during this phase will be accomplished by Philco personnel.

3.2.4 Phase IV Activities

Phase IV will commence immediately upon completion of Phase III of the last equipment and will be accomplished by station operation and maintenance personnel under the supervision of Philco installation of checkout personnel.

3.2.5 Implementation Tasks, TTS

Implementation of the Multi-Satellite Augmentation Program, Phase B-2 at Thule Tracking Station, includes the following tasks:

1. Disconnect, prepare for storage, and remove to a Government designated storage area the Verlort radar van with all its contents plus the antenna, pedestal, three phase delta power transformers, all associated cables and waveguide, and the boresight target board.
 - a. Coaxial and control cables to the Verlort boresight target will be stubbed off with ends protected for possible future use.

- b. Radome and heating will remain for use with MUSAP, Phase B-2.
- 2. Disconnect, prepare for storage, and remove to a Government designated storage area, the Milgo data van, the administration and control van, and the telemetry van with all contents and associated cables.
- 3. Disconnect, prepare for storage, and remove to a Government designated storage area the instrumentation van with all its contents and associated cables except Cabinet OA-185.
 - a. OA-184 will be removed from the van and reinstalled in Room 108 of Building S-1824. The communications panel should be removed from Cabinet OA-185 and be located within the quad-helix antenna control cabinet (OA-184).
- 4. Disconnect, prepare for storage, and remove to a Government designated storage area, all junction boxes, termination cabinets, cables and miscellaneous hardware which are not required for MUSAP Phase A.
- 5. Provide, fabricate and install adapter rings as required to install a VHF command antenna on the existing Verlor antenna support structure. Adapter rings will provide correct bolt circle.
- 6. Building preparation in Building S-1824 for new equipment installation.
 - a. Cable tray and wireway
 - b. Secondary power
 - c. Technical and utility ground systems
 - d. Cable access holes.

7. Installation of new equipment with interconnecting instrumentation cables as follows:
 - a. 400-Mc command and Doppler subsystem (9 fixed racks, 1 mobile rack and 1 cable termination cabinet) in Room 108.
 - b. 150-Mc command subsystem (4 racks and 1 cable termination cabinet) in Room 113.
 - c. VHF Command antenna, Yagi type, on existing Verlort antenna support structure.
 - d. Amplidyne drive with environmental cabinet in base of Verlort antenna support structure.
 - e. 400-Mc preamplifier, mixer, diplexers and filters in quad-helix antenna support structure.
8. Modification of the MUSAP Phase B-2 requirements as follows:
 - a. Install 400-mc helices on quad-helix antenna.
 - b. Install new chassis and inter-rack cables to accommodate VHF command capability in SOC.
 - c. Install inter-rack cables and equipment as required in station program board, command logic, and telemetry data processor equipment to accommodate VHF command capability.
9. Reinstall 26- 1/2- foot radome on Verlort antenna support structure.

3.2.6 Implementation Tasks, FGS

Implementation of the Multi-Satellite Augmentation Program, Phase B-2 at Fort Greely Tracking Station, includes the following tasks:

1. Command Transmitter Area
 - a. Install 150-mc command equipment in Room 103 (4 racks and 1 cable termination cabinet).

- b. Install amplidyne drive equipment in Room 108.
- c. Install VHF command antenna, Yagi type, on C/T building antenna support over Room 103.
- d. Install 26- 1/2-foot radome, Universal Molded Products type.
- e. Install instrumentation cable from termination cabinet in Room 103 to termination cabinet in Room 111, C/T building. Approximate requirements are 38 pair. This cable will connect new equipment to existing outside cable plant and interface with existing timing equipment in Room 111. Present planning does not require additional outside cable to the receiving area.
- f. Install inter-rack instrumentation and r-f cables as required for the VHF command subsystem.

2. T&D No. 2 Area

- a. Relocate existing antenna control console (OA-31) and its associated overhead time display unit to Room 102.
- b. Install 400-mc command and autotrack equipment in Room 106 (8 racks).
- c. Install remote digital terminal equipment (1 rack).
- d. Install modifications as required in existing servo equipment to interface 60-ft. antenna and MUSAP systems.
- e. Install 400-mc 1-kw transmitter and preamplifier equipment on the 60-ft. antenna.
- f. Repair, replace parts, modify and otherwise complete activation of the 60-ft. antenna.
- g. Install inter-rack instrumentation cables for new Phase B-2 equipment, for relocated OA-31 and time display unit, and for interface with existing equipment.
- h. Prior to the start of Items a through g, extensive facility modifications must be accomplished. These are defined by the A&E criteria in Section 8 and will be accomplished through the Corps of Engineers.

3. DAP Area

- a. Modify existing C&D subsystem equipment in Room 133 to provide VHF command interface.
 - (1) Add chassis and cabling to SOC.
 - (2) Install interface cabling to program board.
- b. Modify existing data equipment in Room 136, command logic and telemetry data processing racks, to provide VHF command and GP-1 interface.
- c. Install inter-rack instrumentation cables for interface between new equipment, modified equipment, and existing equipment.

4. Building Preparation In All Areas

- a. Cable tray and wireway
- b. Secondary power
- c. Technical and utility ground systems
- d. Cable access holes.

3.3 PERSONNEL PLANNING AND CONTRACTOR TRAINING

3.3.1 Contractor Training

Training will be provided to selected contractor personnel who will be responsible to conduct Phase III and IV tests of the I&C program and to perform operation and maintenance. Effort provided in support of this training will include training analysis, instructor preparation services, development of training material and classroom presentations. Selected Air Force personnel may attend in-house and vendor courses as determined by the 6594th Aerospace Test Wing. Effort in support of contractor training is as follows:

- 1. Training Analysis. A study of the system, equipment, and personnel planning data to determine actual training requirements. The results of this analysis will provide the basis for development of suitable courses and training materials.

2. Instructor Preparation Services and Training Materials.

Instructors will prepare for classroom presentation. They will acquire necessary documentation, develop theory of operation, design block diagrams, prepare student handout material, develop training aids and devices, and initiate a teaching plan. The instructors will be required to present certain aspects of a particular subsystem during the indoctrination phase. Two of the instructors will be required to present the transistor review and digital transition courses and training materials.

3. Classroom Presentations. Courses will be presented in accordance with required on-site need dates for Phase III and IV personnel.

3.3.2 Personnel Requirements

Personnel Planning Information (PPI) will be developed in accordance with AFSSD Exhibit 61-94. This information will detail the personnel required to manage, operate, maintain and provide technical and non-technical support for satellite tracking stations. PPI is projected over 10 calendar quarters of station operation and provides the following:

1. Physical description of the station, showing location of major facilities and work areas within these facilities.
2. Operation, maintenance and logistics support assumptions.
3. Proposed functional and administrative organization.
4. Numbers and types of personnel required to support the station.
5. Recommendation for types of Air Force personnel (AFSC) to participate in R&D testing.

6. Projected requirements for numbers and types of personnel over the 10-quarter period.
7. Detailed job description for each technical position required for R&D testing.

The performance of the above task requires an analysis of each station during development to determine on-site operating maintenance and technical support tasks. This basic data is evaluated within the framework of orbital support requirements for each station to develop appropriate operation, maintenance and technical support organization for the stations. This organization is supplemented by managerial, administrative and nontechnical support personnel to provide a complete capability to support the orbital test requirement of the station.

This task is conducted on a continuous basis for each station to provide quarterly revision to previously reported data.

3.4 LOGISTICS REQUIREMENTS

3.4.1 Logistics

Tables of equipment and inventory lists, IBM data lists and provisioning lists will be revised to show the deletion of equipment and spares to be removed from TTS under MUSAP, Phase B-2. Prior to the removal of equipment from TTS, Philco WDL will provide AFSSD and the 6594th Aerospace Test Wing an inventory of all spares that will no longer be required at the site. Disposition of the spares will be in accordance with instructions to be provided by the 6594th Aerospace Test Wing.

Tables of equipment and inventory lists, IBM data lists and provisioning lists for TTS and FGS will be revised to show the modifications and additional equipment to be provided under MUSAP,

Phase B-2. Initial spares and initial technical operating materials (excluding magnetic tape) to support the new equipment through Phase IV of I&C plus 180 days, will be provided in accordance with WDTIC Exhibit 57-29 and MIL-P-9855A.

Upon approval of this plan, Philco WDL will begin procurement of the spares for the FGS equipment that will be reactivated under MUSAP, Phase B-2, which were not provisioned initially under Program 461 or MUSAP, Phase A.

3.5 MANUALS AND PROCEDURES

3.5.1 Technical Manuals

Upon approval of this Plan, Philco WDL will terminate all technical manual revisions under AF04(695)-278 for the equipment to be removed under MUSAP Phase B-2. The Technical Manual Plan (for revision of existing manuals and provision of new manuals) will be prepared for new or modified equipment to be provided under this contract in accordance with AFSSD Exhibit 61-14A.

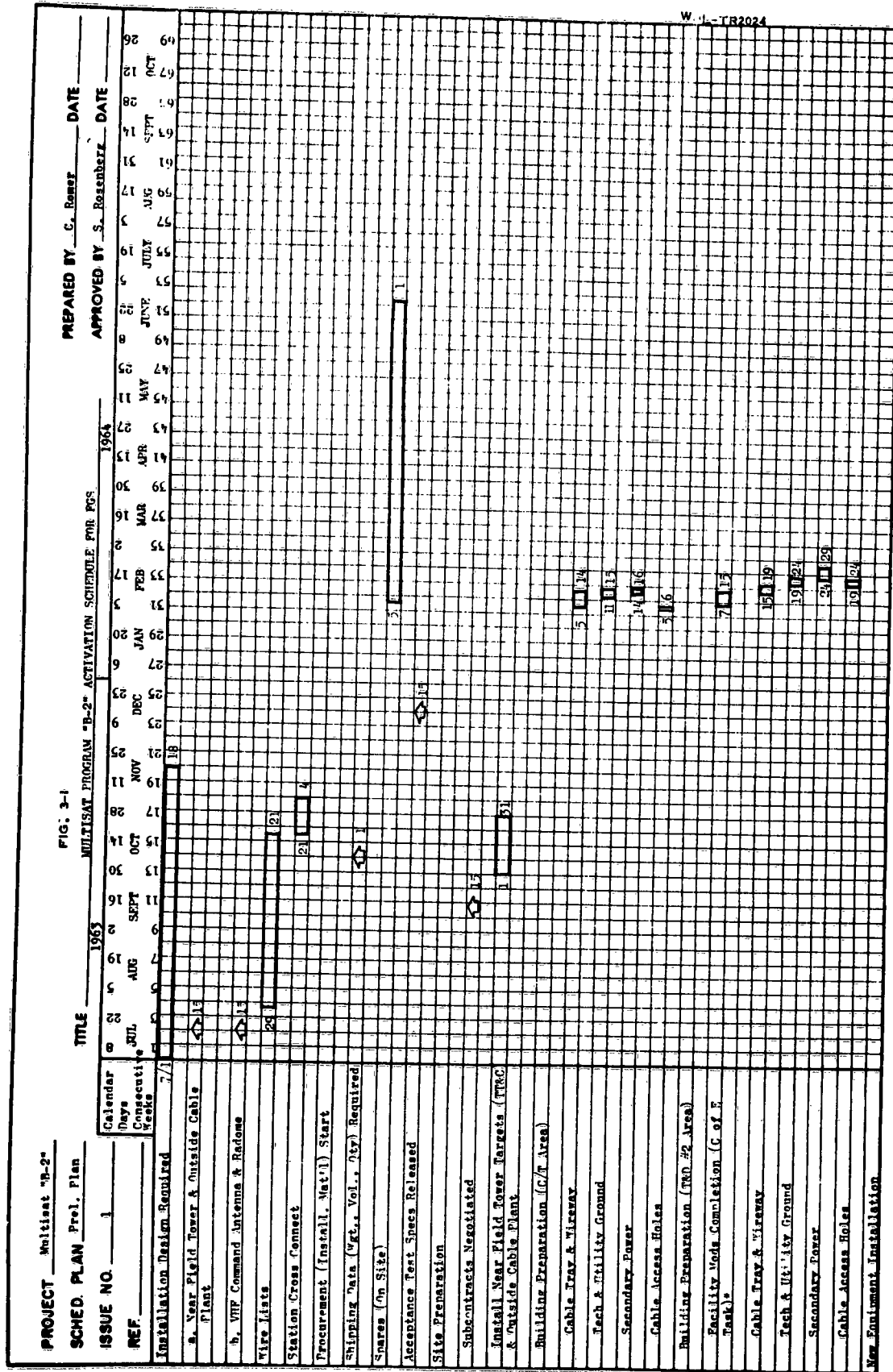
3.5.2 Preventive Maintenance Requirements

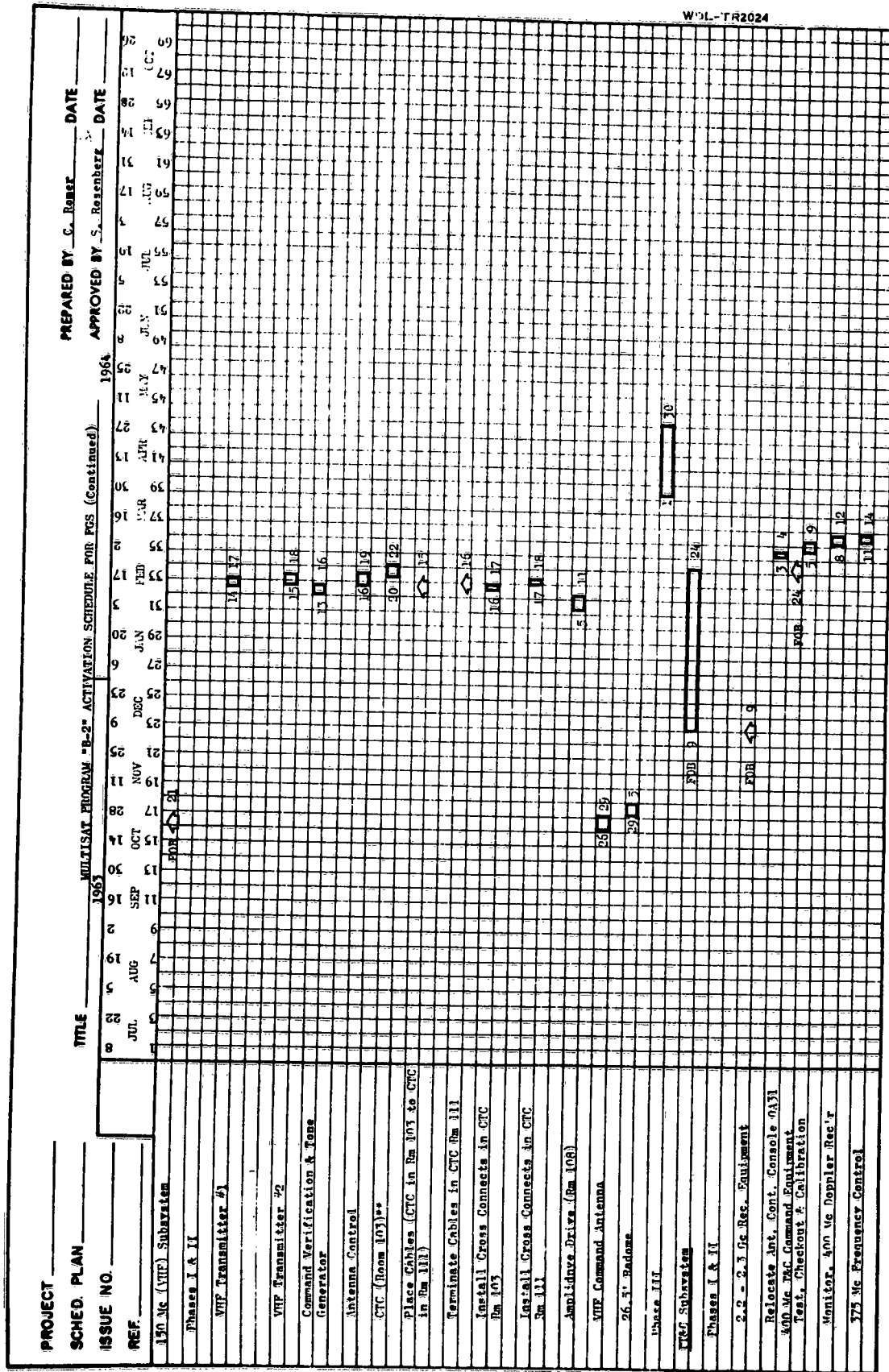
Revisions to preventive maintenance documents under AF04(695)-278 will be terminated for the equipment to be removed. Preventive maintenance documents will be provided for the equipment being added and for the modifications to existing equipment.

3.5.3 Test Procedures

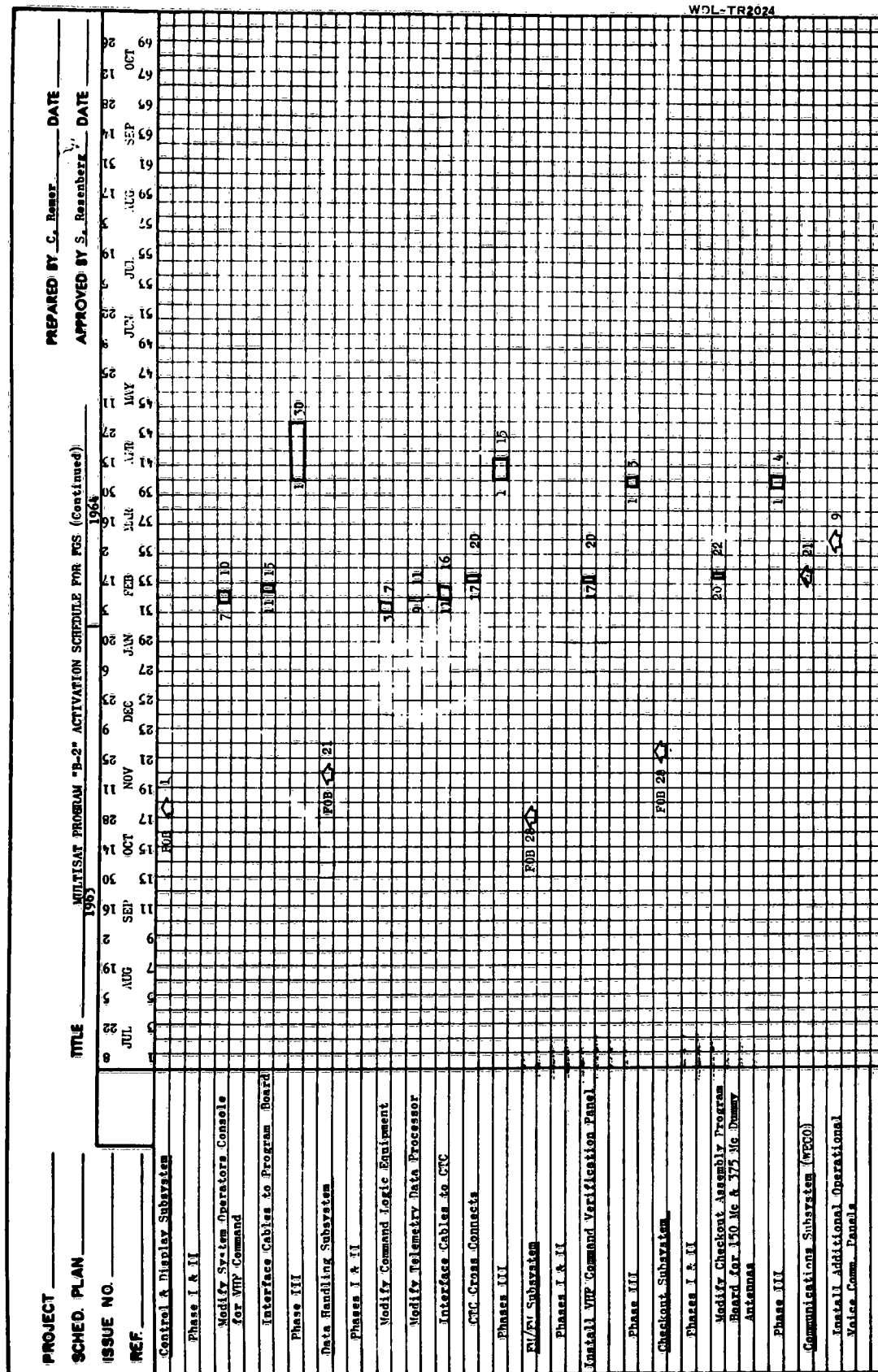
Phase III Test Procedures. Philco WDL will provide test procedures, data sheets, and certification documentation to perform, record, and certify satisfactory completion of a Phase III checkout of each subsystem.

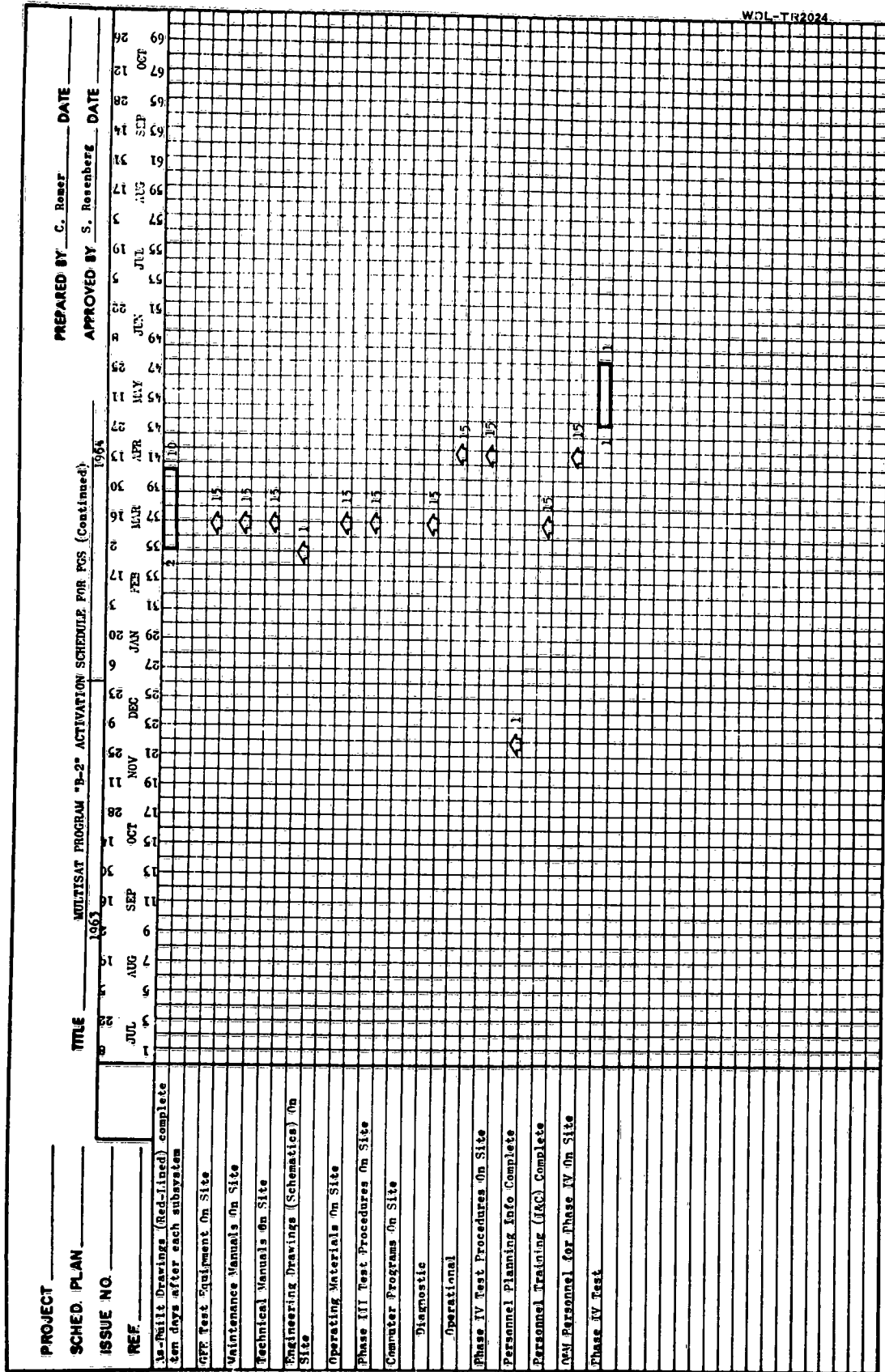
Phase IV Test Procedures. Phase IV test procedures are the responsibility of the Integrating Contractor and will provide for tests to be conducted under the technical supervision of the associate contractor.





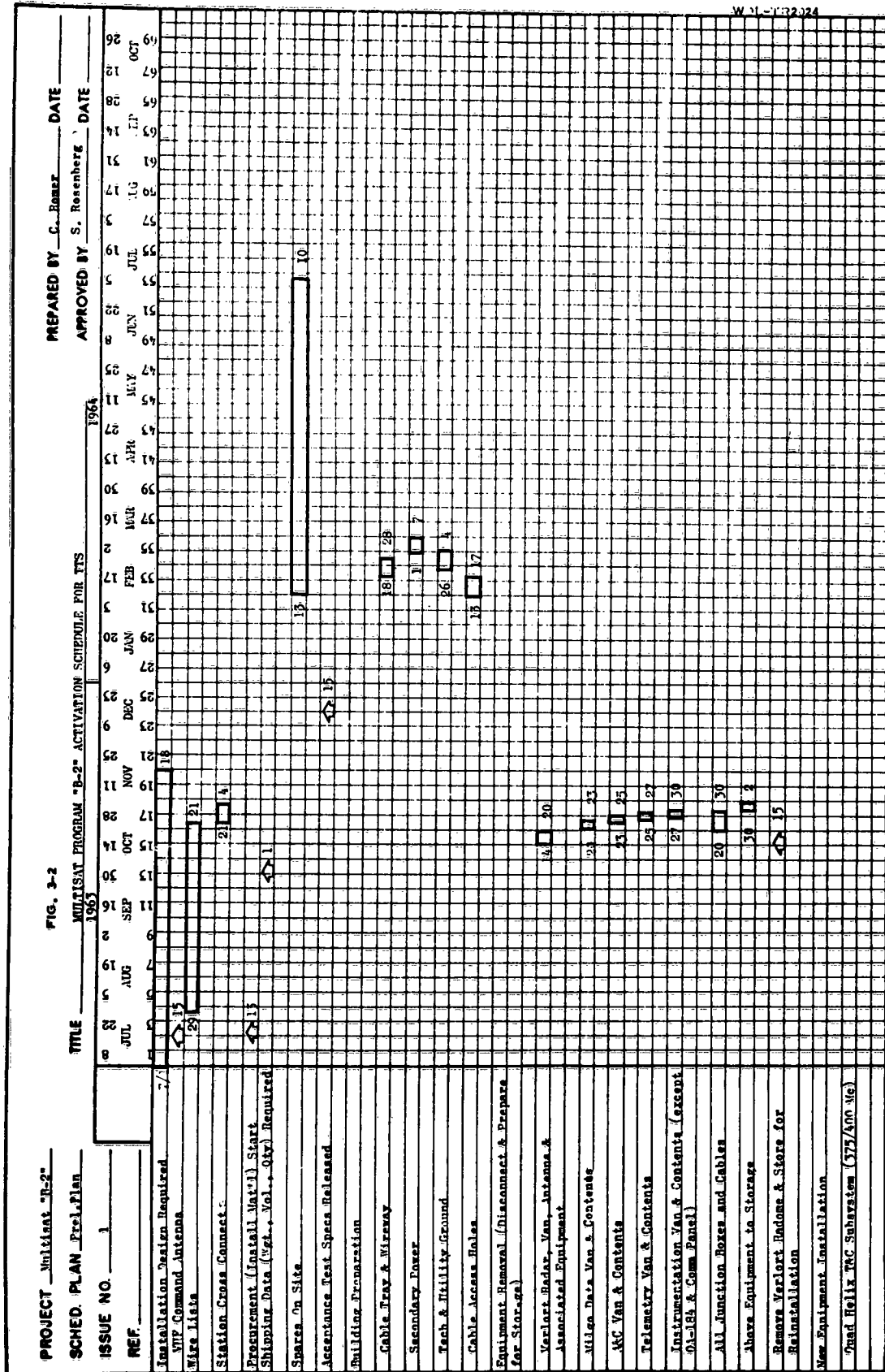
PROJECT		PREPARED BY C. Rorer		DATE	
SCHED. PLAN		APPROVED BY S. Reinhardt		DATE	
ISSUE NO.		TITLE		ACTIVATION SCHEDULE FOR POS. (Continued)	
REF.		1964		1965	
		JUL	AUG	SEP	OCT
Receiver #1, 400 Mc					
Receiver #2, 400 Mc					
Remote Digital Terminal					
Monitor Exciter					
775 Mc 15w Transmitter Exciter					
RP Filter Assembly					
Modify Existing Intermediate Servo					
1 Kw 775 Mc Transmitter on Antenna					
Preamplifier Equipment on Antenna					
Repair & Replace 'mits A/R to					
Activate 60' Antenna					
Place & Terminate Interface Cables					
to Existing CTC					
400 Mc Paramp					
Install 3:2 Axis Converter					
CTC Cross Connects					
Install Line Drivers to FM/FM					
Ground Station					
Relocate Horesight Antennas					
Remove & Replace Interim Horesight					
Equipment					
Phase III					
Timing Subsystem					
Phases I & II					
Install Station Status Control Unit					
at JTRC					
Connect other Timing Units					
Phase III					





PREPARED BY C. Roser
APPROVED BY S. Rosenberg

DATE
DATE



PROJECT _____		PREPARED BY C. Raser	DATE _____
SCHED. PLAN _____		APPROVED BY S. Rosenberg	DATE _____
ISSUE NO. _____		MULTISAT PROGRAM "B-2" ACTIVATION SCHEDULE FOR TTS (Continued)	
REF. _____		TITLE	
Phases I & II		1963	
400 Mc Quad Helix Subsystem		JUL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Doppler Data Converter		FEB 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Align. Checkout & Calibration		MAR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Receiver #1 (400 Mc)		APR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Receiver #2 (400 Mc)		MAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Monitor, 400 Mc Doppler		JUN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
15 w Transmitter, Exciter		JUL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
1 KW Power Amplifier		AUG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Duplexer		SEP 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Mobile Test Cabinet		OCT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Cable Termination Cabinet		NOV 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Antenna Control OA-184 (Reinstall from Van)		DEC 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Communications Panel (Install in OA-184)		JAN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
400 Mc Presamplifier & Mixer		FEB 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Duplexer & Filters		MAR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
400 Mc Helices		APR 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Phase III		MAY 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
150 Mc (VHF) Antenna Subsystem		JUN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Phases I & II		JUL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
VHF Transmitter #1		AUG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
VHF Transmitter #2		SEP 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	
Antenna Control & Servo		OCT 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	

[illegible]

PROJECT _____		PREPARED BY C. Roser		DATE _____	
SCHED. PLAN _____		APPROVED BY S. Rosenberg		DATE _____	
ISSUE NO. _____		TITLE		MULTISAT PROGRAM "B-2" ACTIVATION SCHEDULE FOR VTS (Continued)	
REF. _____				1964	
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Command Verification & Tone Generator					
Cable Termination Cabinet					
Amplidyne & Cabinet					
Install Adapter Ring (s) A/R					
VTP Command Antenna					
Reinstall 26.5' Radome					
Phase III					
Control & Display Subsystem					
Phases I & II					
Modify Station Operators Console for VTP Command					
Phase III					
Site Handling Subsystem					
Phases I & II					
Modify Command Logic Equipment					
Install Interface Cables to Program Board Facility					
Phase III					
Timing Subsystem					
Phases I & II					
Install required time display indicators Station Control Units & TOD for 150 Mc & 375/400 Mc					
TAC Subsystem					
Phase III					
EN/PU Subsystem					
Phases I & II					
Install VTP Command Verif. Panels					
Phase III					

PROJECT _____		PREPARED BY C. Roney _____		DATE _____	
SCHED. PLAN _____		MULTISAT PROGRAM "B-2" ACTIVATION SCHEDULE FOR TTS (Continued)		APPROVED BY S. Rosenberg _____	
ISSUE NO. _____		TITLE _____		DATE _____	
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SECTION 4

PROGRAM SPECIFICATIONS (DOCUMENTATION)

SECTION 4
PROGRAM SPECIFICATIONS (DOCUMENTATION)

4.1 SPECIFICATIONS

4.1.1 General

The contractor will use those subsystem and equipment specifications which are currently approved by AFSSD, modified as applicable, for MUSAP Phase B-2. Additional specifications will be prepared for those subsystems and associated equipment that require major modification or new equipment.

Specifications have been or will be prepared, as appropriate, in accordance with AFSCM 375-1, Exhibit II, Chapters 2 and 3.

Internal contractor specifications that do not require AFSSD approval, i.e., equipment specifications for the purpose of procurement and vendor acceptance tests, will be deliverable for informational use when requested by the contracting officer.

The suffix "Phase B-2" will be used after each specification nomenclature to differentiate it from MUSAP- Phase A, as applicable.

4.1.2 Definitions of Applicable Specifications

System Specification (-10). This is a contractual deliverable document outlining the basic system description, performance and test requirements. It also presents identification of major subsystems and required operating parameters.

Subsystem Specification (-09). This is a contractual deliverable document that includes detailed descriptions of equipment, subsystem performance requirements, and detailed acceptance test plans.

Procurement Specification (-02). This is a Philco in-house document that specifies design requirements of an item and any accessory items that are procured. It also includes particular performance and test requirements. This document may be used for in-house, intra-group or vendor procurement.

Acceptance Test Specification (-04). This is a document specifying in detail the functional test procedures for an individual item or equipment. These tests shall insure that the performance parameters specified in the related procurement specifications have been met and that proper parts and workmanship requirements have been followed.

4.2 TENTATIVE LIST OF SPECIFICATIONS FOR MUSAP PHASE B-2*

4.2.1 VHF (150 Mc) Antenna Subsystem (FGS and TTS) (Complete)

1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-XXXX-09 (Phase B-2).
2. Equipment specifications (Including procurement and acceptance test specifications):

a. VHF Command Transmitter

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

* Specifications with XXXX indicated in second grouping of specification number are not available and new specifications will be prepared.

b. Antenna Control Equipment

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

c. Command (Echo Check) Detector

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

d. Tone Generator

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

e. Switching Panel

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

f. Crossed Yagi Antenna

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

g. Two-Axis Pedestal

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

h. Dummy Load

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

4.2.2 60-Foot TT&C Subsystem (FGS) (Partial)

1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-XXXX-09 (Phase B-2).
2. Equipment specifications (Including procurement and acceptance test specifications).
 - a. 400-Mc Parametric Preamplifier
 - (1) Procurement: 98-2162-02 (Phase B-2)
 - (2) Acceptance Test: 98-XXXX-04 (Phase B-2).
 - b. 400-Mc Monopulse Preamplifier
 - (1) Procurement: 98-2019A-02 (Phase B-2)
 - (2) Acceptance Test: 98-XXXX-04 (Phase B-2).
 - c. Noise Generator
 - (1) Procurement: 98-2162-02 (Phase B-2)
 - (2) Acceptance Test: 98-XXXX-04 (Phase B-2).
 - d. One Kw Power Amplifier, 375 Mc
 - (1) Procurement: 98-2219-02 (Phase B-2)
 - (2) Acceptance Test: 98-XXXX-04 (Phase B-2).
 - e. Checkout and Calibration Equipment, 400 Mc
 - (1) Procurement: 98-XXXX-02 (Phase B-2)
 - (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

f. 400-Mc Doppler Receiver Monitor

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

g. Exciter Monitor

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

h. 15 W Transmitter Exciter

- (1) Procurement: 98-2013A-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

i. 400-Mc Frequency Control

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

j. 400-Mc Doppler Receiver

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

k. R-F Filter Assembly

- (1) Procurement: 09-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

l. Doppler Data Converter

- (1) Procurement: 98-2255-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

m. 400-Mc R-F Feed

- (1) Procurement: 98-2304-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2)

n. Comparator

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98- 2331-04 (Phase B-2)

o. Tracking and Data Console

- (1) Procurement: 98-1607-02 (Phase B-2)
- (2) Acceptance Test: 98-1607-04 (Phase B-2).

p. Boresight Tower

- (1) Procurement: 98-2237-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2)

4.2.3 Quad-Helix Telemetry and Command Subsystem (TTS) (Partial)

- 1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-XXXX-09 (Phase B-2).
- 2. Equipment specifications (Including procurement and acceptance test specifications):

a. 400-Mc Parametric Preamplifier

- (1) Procurement: 98-2162-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

b. R-F Assembly (Preamp Mixer)

- (1) Procurement: 98-1822-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

c. Noise Generator

- (1) Procurement: 98-2162-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

d. One-Kw Power Amplifier

- (1) Procurement: 98-2219-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

e. Checkout and Calibration Equipment, 400 Mc

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

f. 400-Mc Doppler Receiver Monitor

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

g. Exciter Monitor

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

h. 15 W Transmitter Exciter

- (1) Procurement: 98-2013A-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

i. 400-Mc Frequency Control

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

j. 400-Mc Doppler Receiver

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

k. R-F Filter Assembly

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

l. Mobile Test Equipment

- (1) Procurement: 98-XXXX-02
- (2) Acceptance Test: 98-XXXX-04.

m. Doppler Data Converter

- (1) Procurement: 98-2255-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

4.2.4 FM/FM Telemetry Subsystem (Partial)

- 1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-2045C-09 (Phase B-2).
- 2. Equipment Specifications (Including procurement and acceptance test specifications):

a. Thule Tracking Station (TTS)

(1) VHF Command Verification Detector

- (a) Procurement: 98-XXXX-02 (Phase B-2)
- (b) Acceptance Test: 98-XXXX-04 (Phase B-2).

b. Fort Greely Tracking Station (FGS)

(1) VHF Command Verification Detector

- (a) Procurement: 98-XXXX-02 (Phase B-2)
- (b) Acceptance Test: 98-XXXX-04 (Phase B-2).

4.2.5 Data Handling Subsystem (TTS and FGS) (Partial)

- 1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-2046B-09 (Phase B-2).
- 2. Equipment specifications (Including procurement and acceptance test specifications):

a. Command Logic Equipment

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

4.2.6 Control and Display Subsystem (TTS and FGS) (Partial)

- 1. Subsystem specifications (Including subsystem performance and acceptance test requirements: 98-2048A-09 (Phase B-2).

2. Equipment specifications (Including procurement and acceptance test specifications):

a. System Operator's Console

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

b. Synchro Data Link Equipment

- (1) Procurement: 98-2129-02 (Phase B-2)
- (2) Acceptance Test: 98-2129-04 (Phase B-2).

c. Display Units: Biaxial and Triaxial

- (1) Procurement: 98-2234-02 (Phase B-2)
- (2) Acceptance Test: 98-2234-04 (Phase B-2).

4.2.7 Checkout Subsystem (TTS and FGS) (Partial)

- 1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-2048A-09 (Phase B-2).
- 2. Equipment specifications (Including procurement and acceptance test specifications):

a. Program Board, Checkout

- (1) Procurement: 98-2307-02 (Phase B-2)
- (2) Acceptance Test: 98-2307-04 (Phase B-2).

4.2.8 Timing Subsystem (TTS and FGS) (Partial)

1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-2047A-09 (Phase B-2).
2. Equipment specifications (Including procurement and acceptance test specifications):

a. Display Equipment, Time

- (1) Procurement: 98-2151A-02 (Phase B-2)
- (2) Acceptance Test: 98-2151-04 (Phase B-2).

b. Control Unit, Station Status

- (1) Procurement: 98-2295-02 (Phase B-2)
- (2) Acceptance Test: 98-2295-04 (Phase B-2).

4.2.9 Communications Subsystem (FGS) (Partial)

1. Subsystem specifications (Including subsystem performance and acceptance test requirements): 98-2050-09 (Phase B-2).
2. Equipment specifications (Including procurement and acceptance test specifications):

a. Operational Voice Communications System

- (1) Procurement: 98-2122-02 (Phase B-2)
- (2) Acceptance Test: 98-2122-04 (Phase B-2).

4.2.10 Boresight Equipment (FGS) (Partial)

1. Equipment specifications (Including procurement and acceptance test specifications):

a. Near-Field Rack Equipment

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

b. Near-Field Equipment (Tower Mounted)

- (1) Procurement: 98-XXXX-02 (Phase B-2)
- (2) Acceptance Test: 98-XXXX-04 (Phase B-2).

SECTION 5

INTEGRATED SUBSYSTEM EQUIPMENT DELIVERY SCHEDULES

SECTION 5
INTEGRATED SUBSYSTEM EQUIPMENT DELIVERY SCHEDULES

5.1 ASSUMPTIONS

The formulation of the schedules included in this section is based upon the following assumptions:

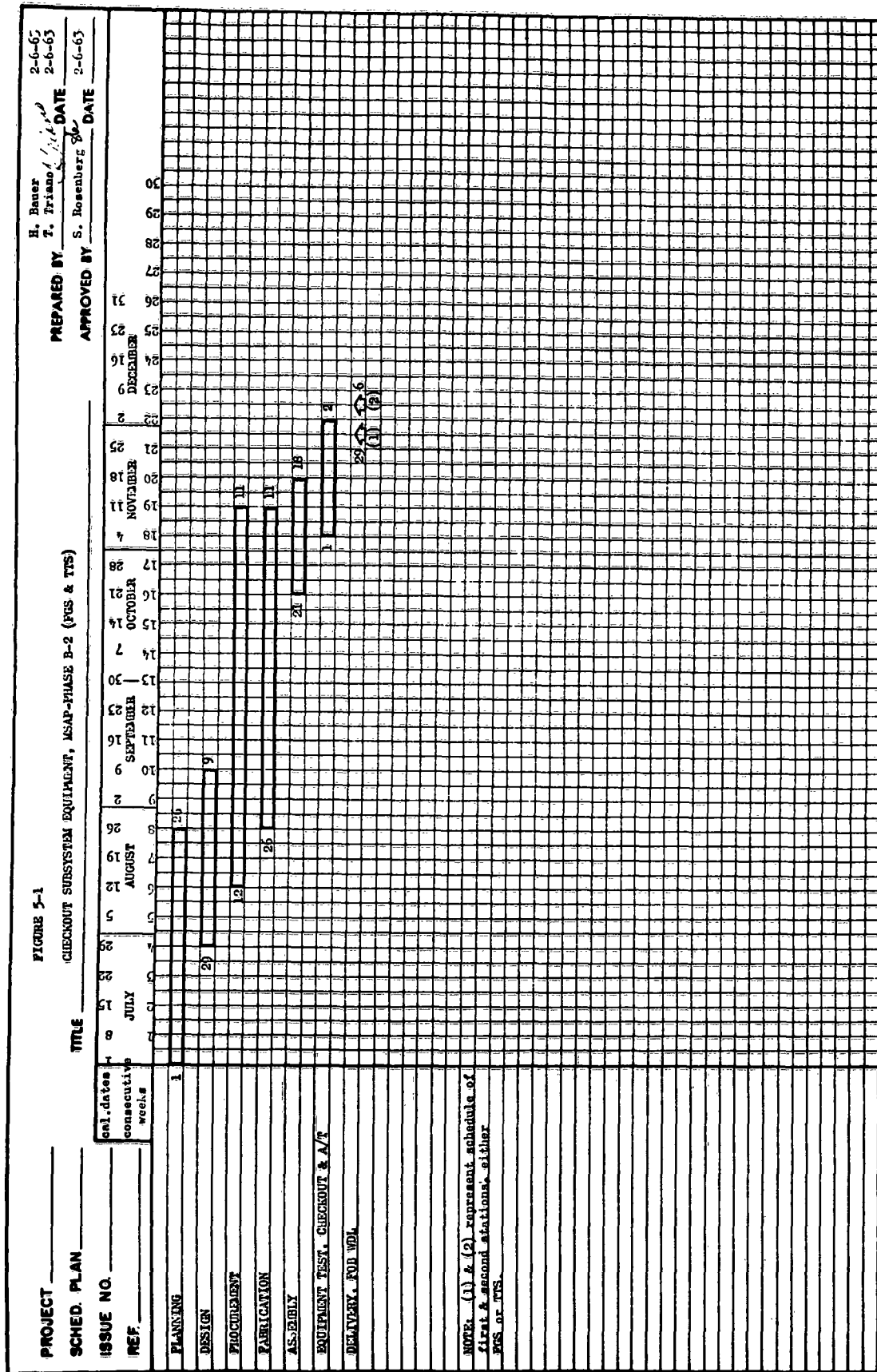
1. AFSSD approved authorization to proceed with the implementation of the Program Plan for MUSAP Phase B-2 on 1 July 1963.
2. Preliminary approval by AFSSD/ASCO prior to the end of the third consecutive week (from date of authorization to proceed) of the following documents:
 - a. Preliminary subsystem specification revisions
 - b. Preliminary subsystem specifications (for new subsystems)
 - c. Preliminary equipment design approaches.
3. Suitable time spacing of activities (manpower loading) involved in Phase B-2 and the major equipment fabrication of MUSAP Phase B-1 for NHS which is also scheduled to commence after 1 July 1963. Such manpower loading will be facilitated by AFSSD approval to permit Philco WDL to perform preliminary planning, analysis and appropriate documentation for MUSAP Phase B-1 during fiscal year 1963, i.e., between February - 1 July 1963.

The schedules may also require re-examination and possible revision depending upon officially required time phasing of future Fiscal Year 1964 efforts involved in the provisioning of required subsystems for VTS and HTS (under separate contractual coverage).

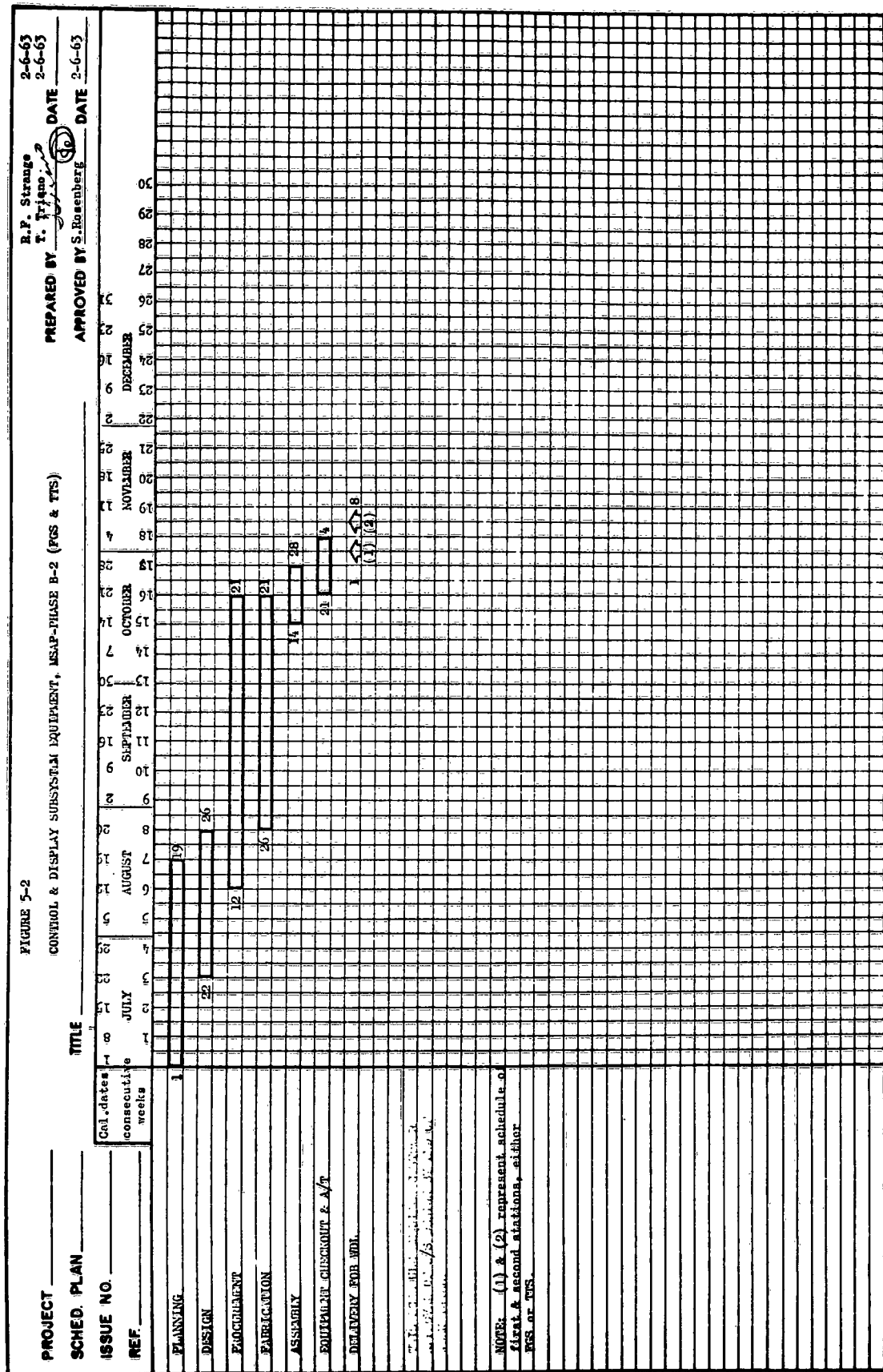
5.2 GENERAL COMMENTS

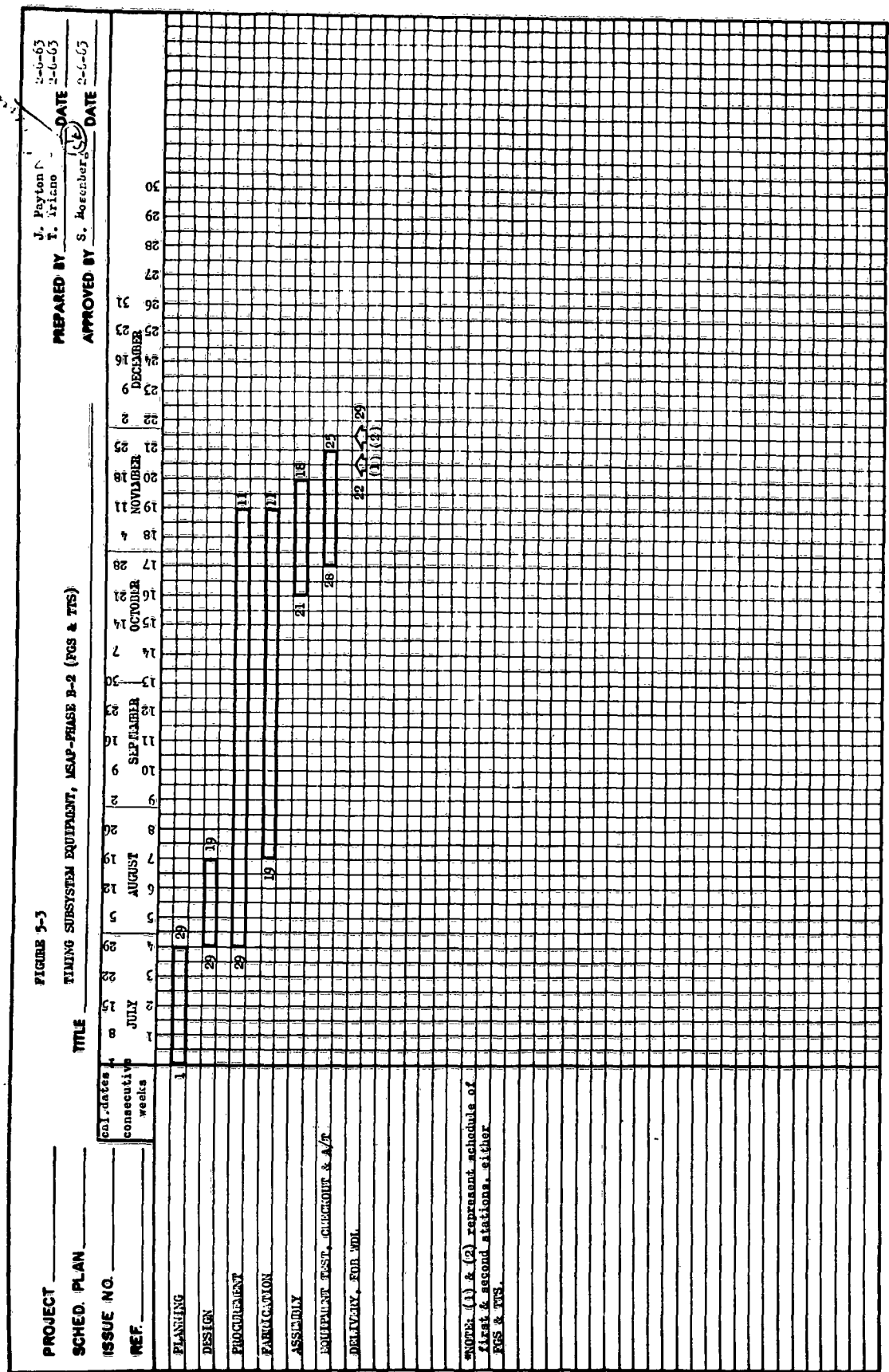
All F.O.B. dates are from Philco WDL.

A majority of the equipment will be ready for shipment to the respective sites on or before 23 weeks from the date of official work authorization. However, the 375/400-mc equipment associated with both the quad-helix T&C (at TTS) and the 60-ft. TT&C (at FGS) sub-systems have much longer F.O.B. dates, i.e., 34 weeks from the date of official work authorization as indicated in Figs. 5-8 and 5-9. These latter extended dates (34 weeks) were based upon the use of the same procurement specifications (revised as required for Phase B-2) for the 400-mc modifications that were prepared for Program 823 at IOS, as well as the same procurement delivery schedules (120-180 days) from the various vendors. The various equipment from the individual vendors is shipped to Philco WDL to be integrated with Philco - fabricated equipment, assembled in chassis and racks, and tested as complete units prior to shipment to the sites.

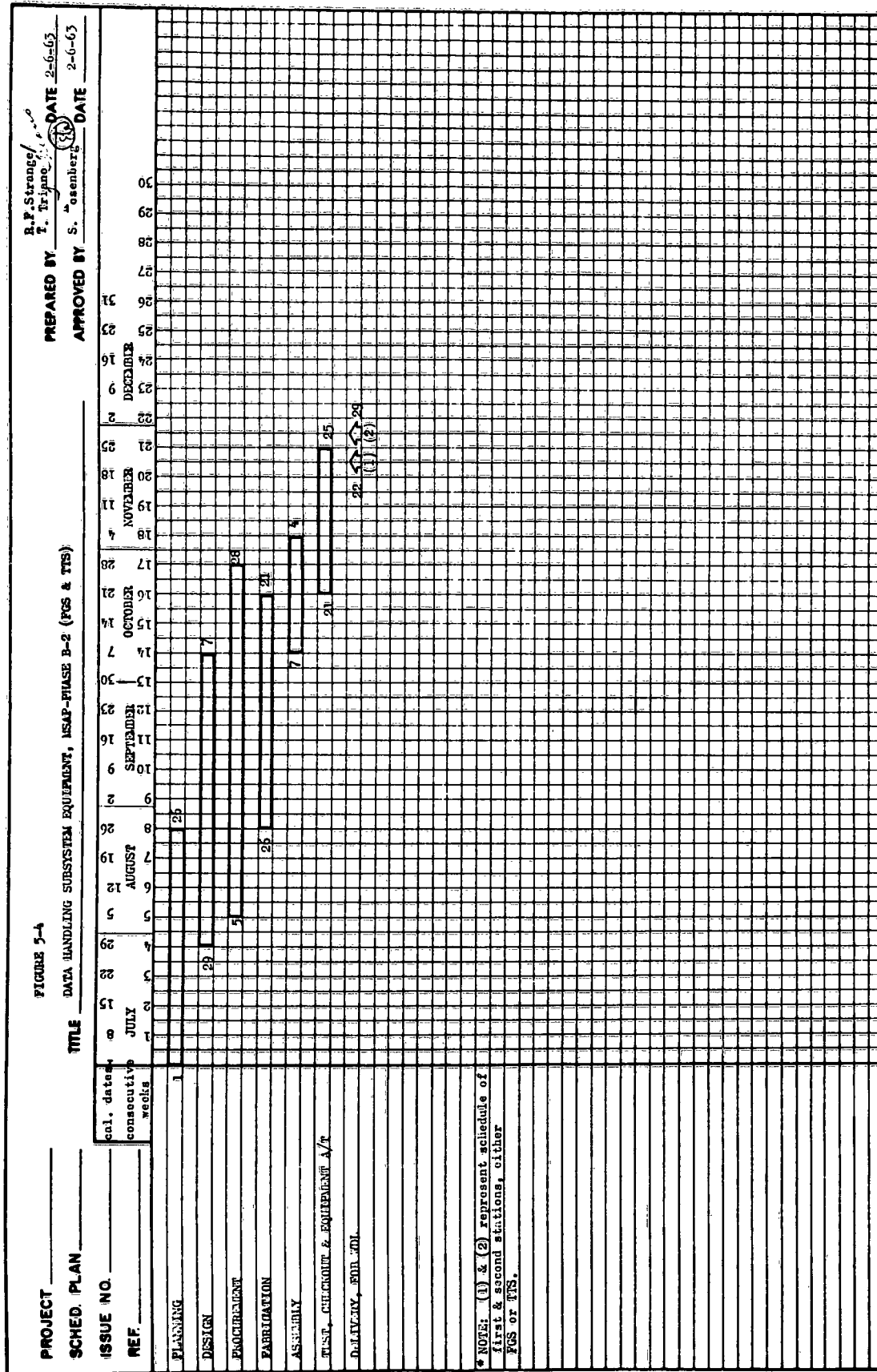


WDL 940 (3-62) 18-90000-05

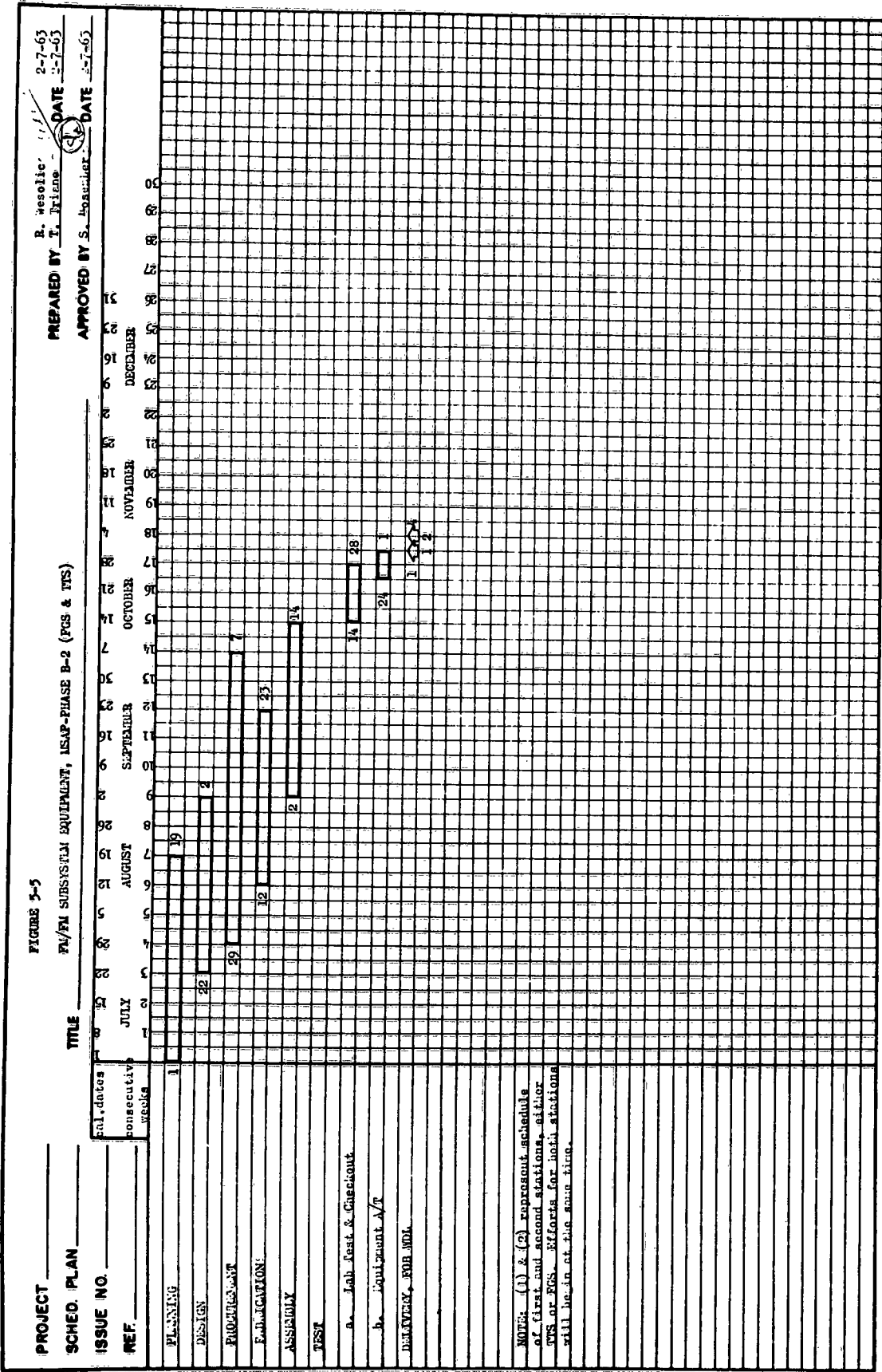




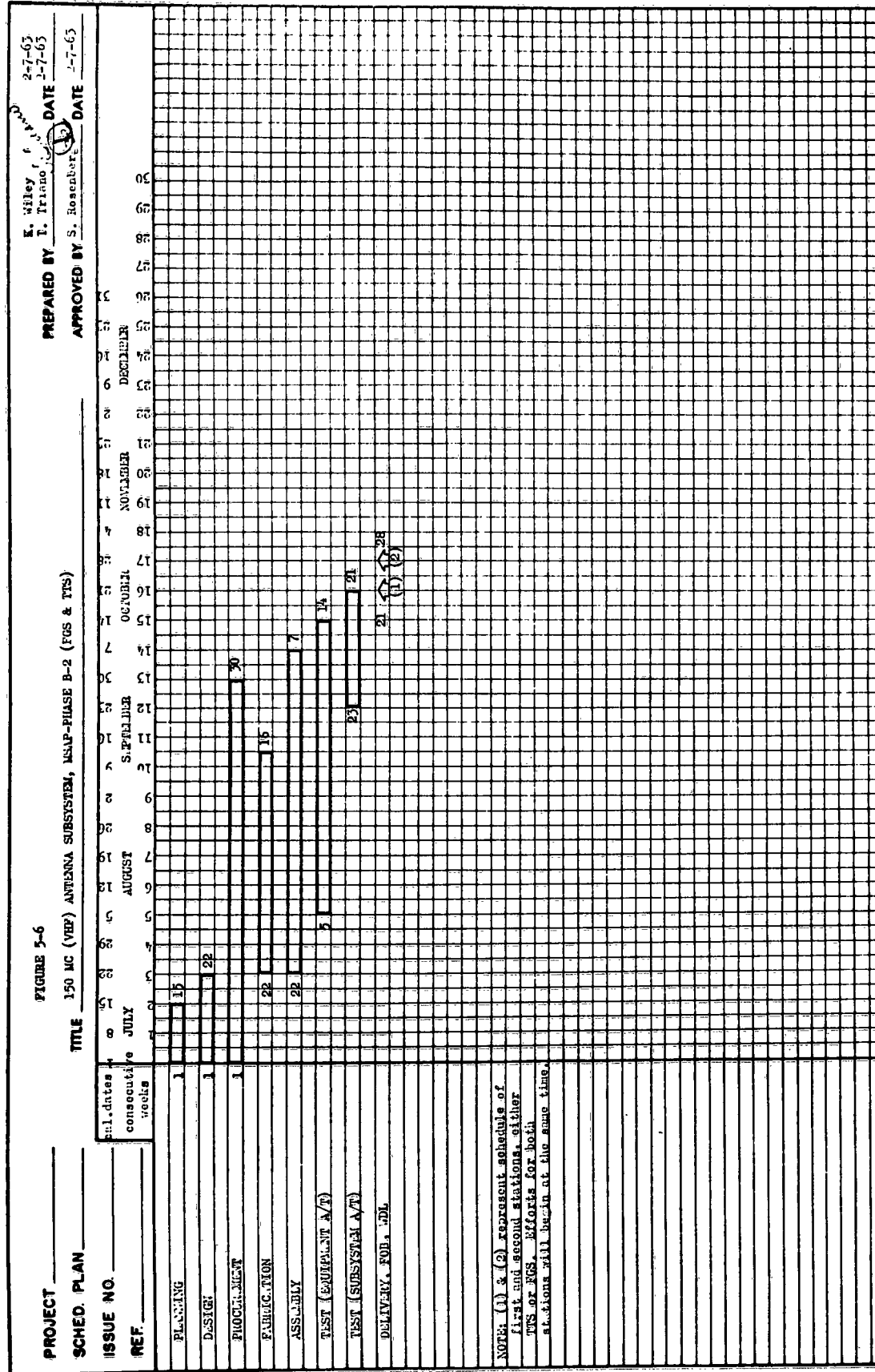
WDL 540 (3-62) 18-900001-05



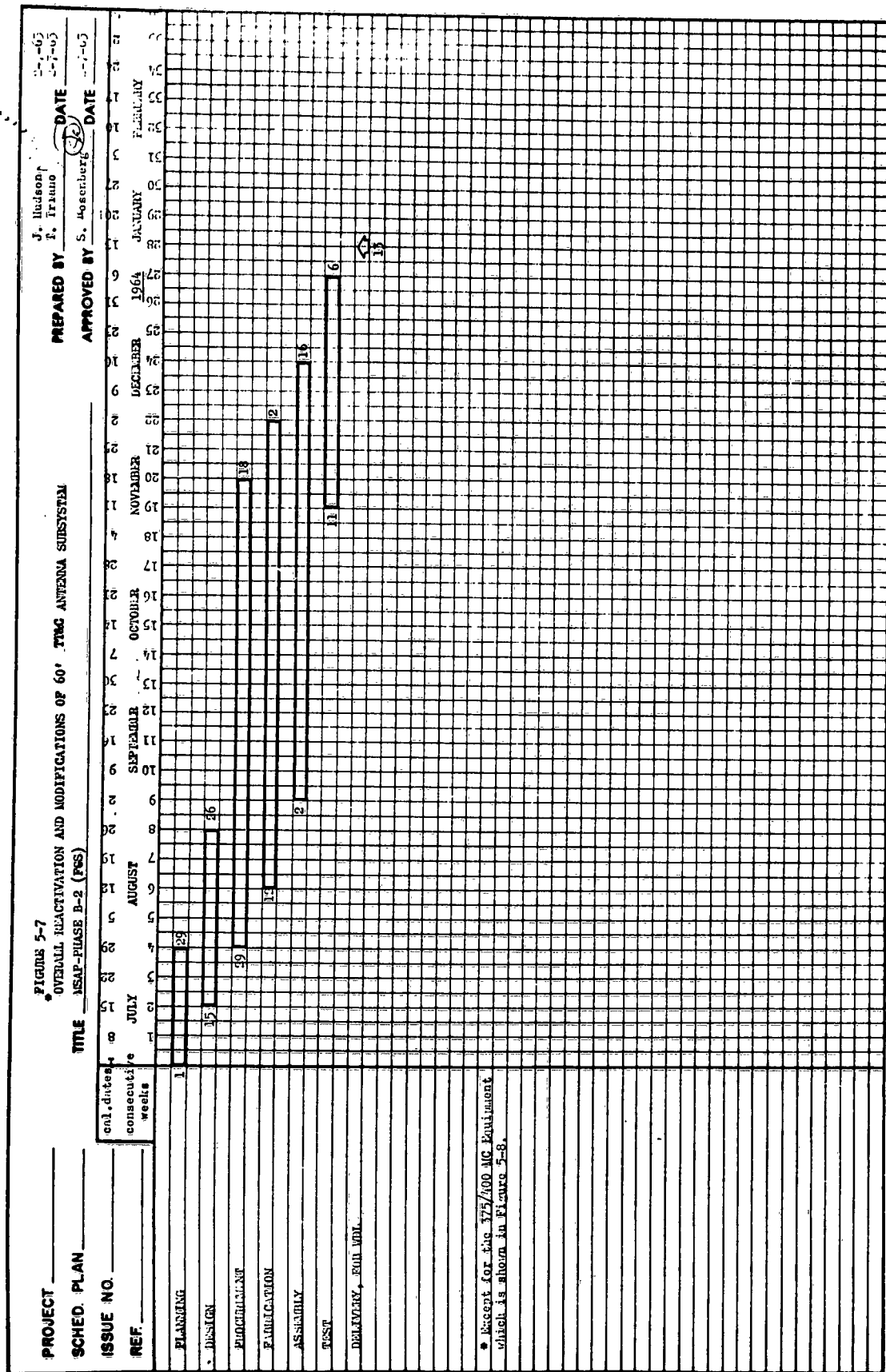
WDL 540 (3-62) (B-900001-05)

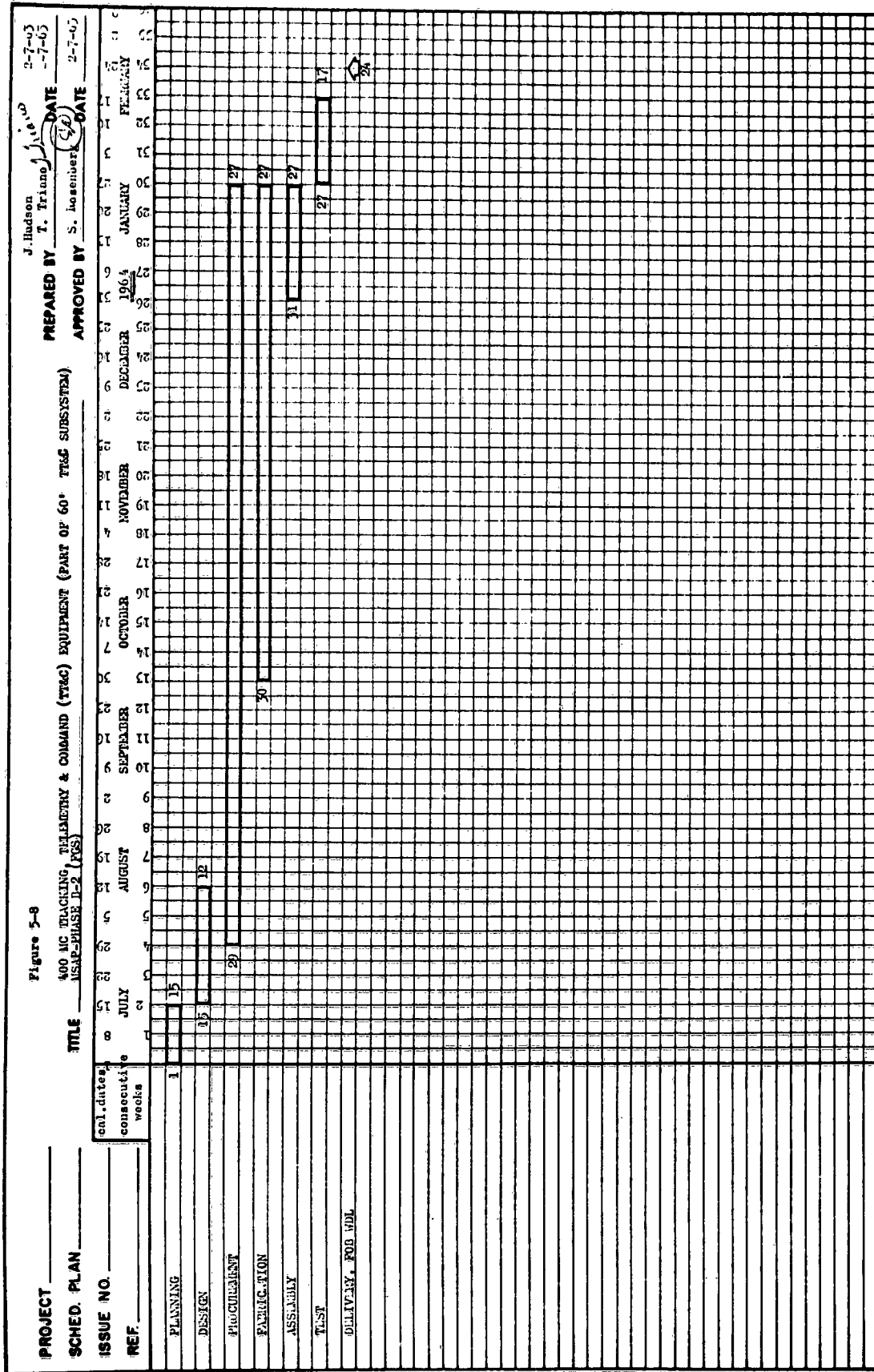


WDL 540 (3-62) (8-900001-05)

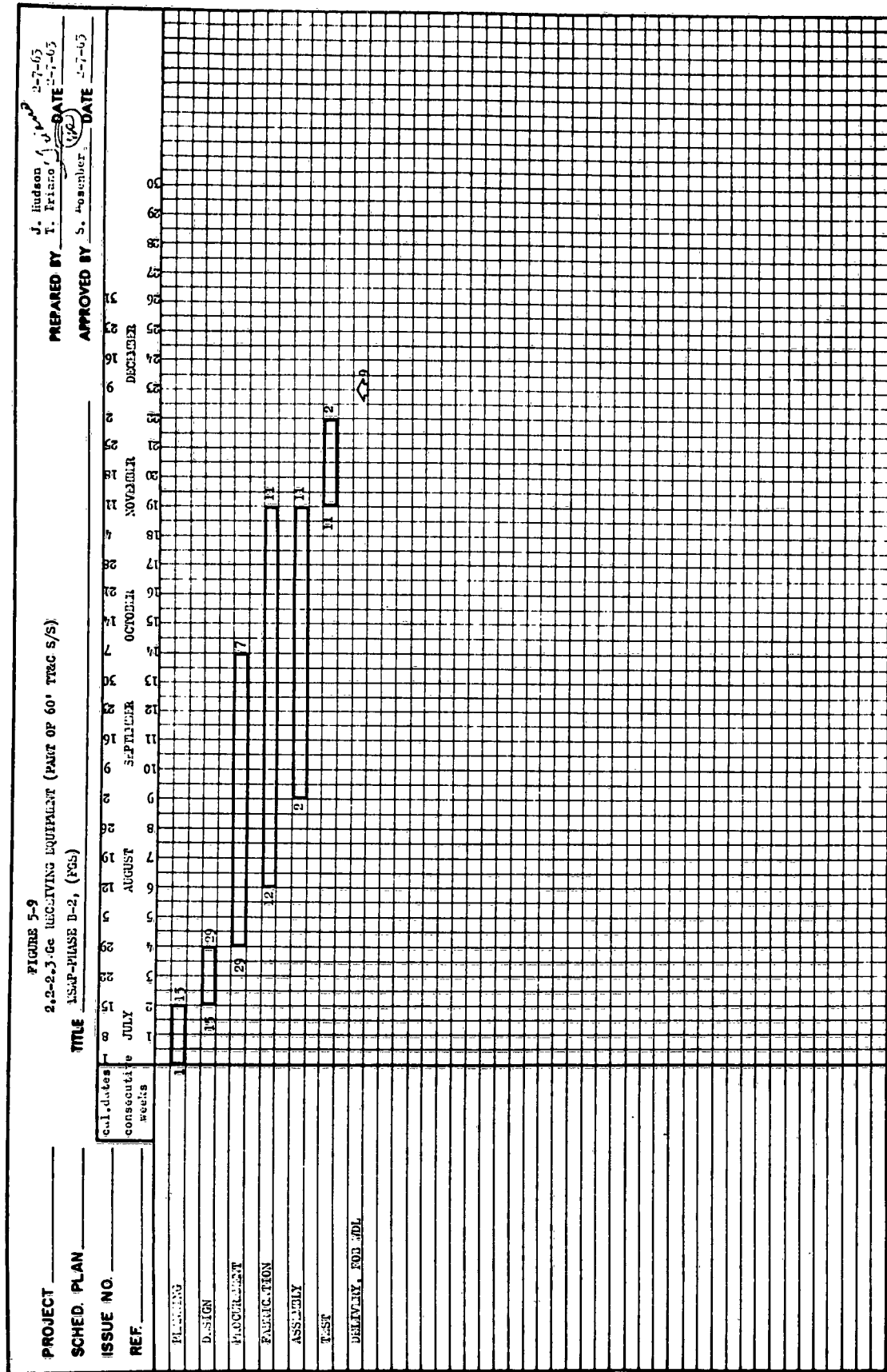


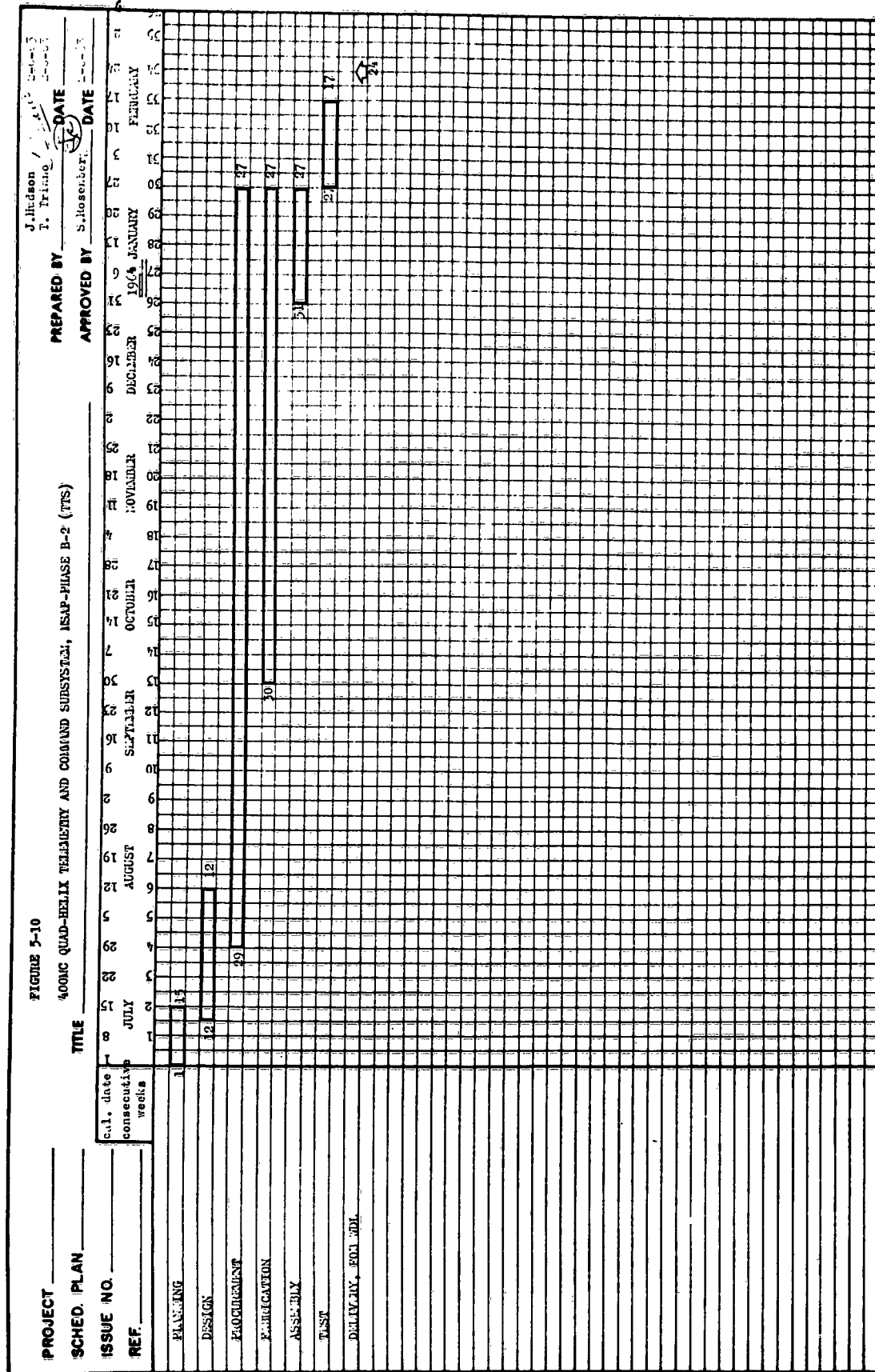
WDL 540 (3-62) (8-900001-05)





WDL 540 (3-62) (8-900001-05)





SECTION 6

DEFINITION OF INTERFACES WITH MUSAP
PHASE A AND EXISTING EQUIPMENT

SECTION 6

DEFINITION OF INTERFACES WITH MUSAP PHASE A AND
EXISTING EQUIPMENT

6.1 GENERAL

Figures 6-1 and 6-2 are preliminary system block diagrams of FGS and TTS which indicate the scope of the functional interfaces with existing and MUSAP Phase A equipment. These figures are located on 6-2 and 6-3. Detailed block diagrams and interface specifications will be provided at a later date during the course of the program.

6.2 FUNCTIONAL NOTATIONS

6.2.1 Proposal Efforts

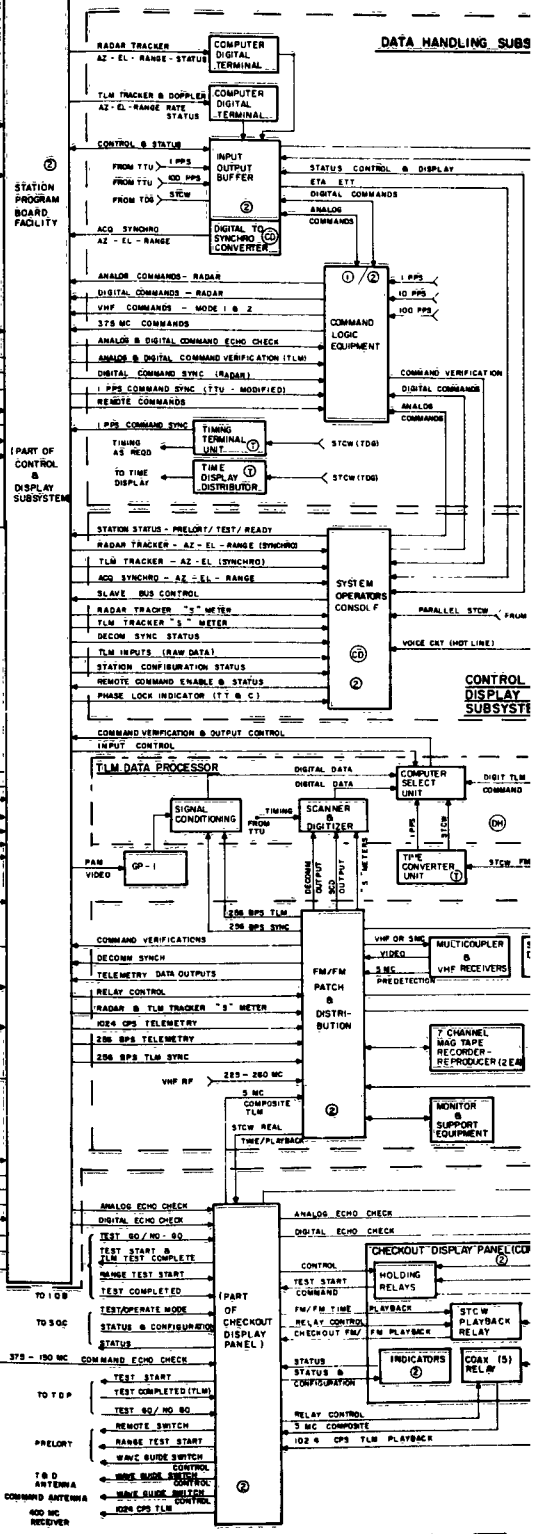
Appropriate notations are included in the functional blocks to indicate the nature of the proposed efforts, as follows:

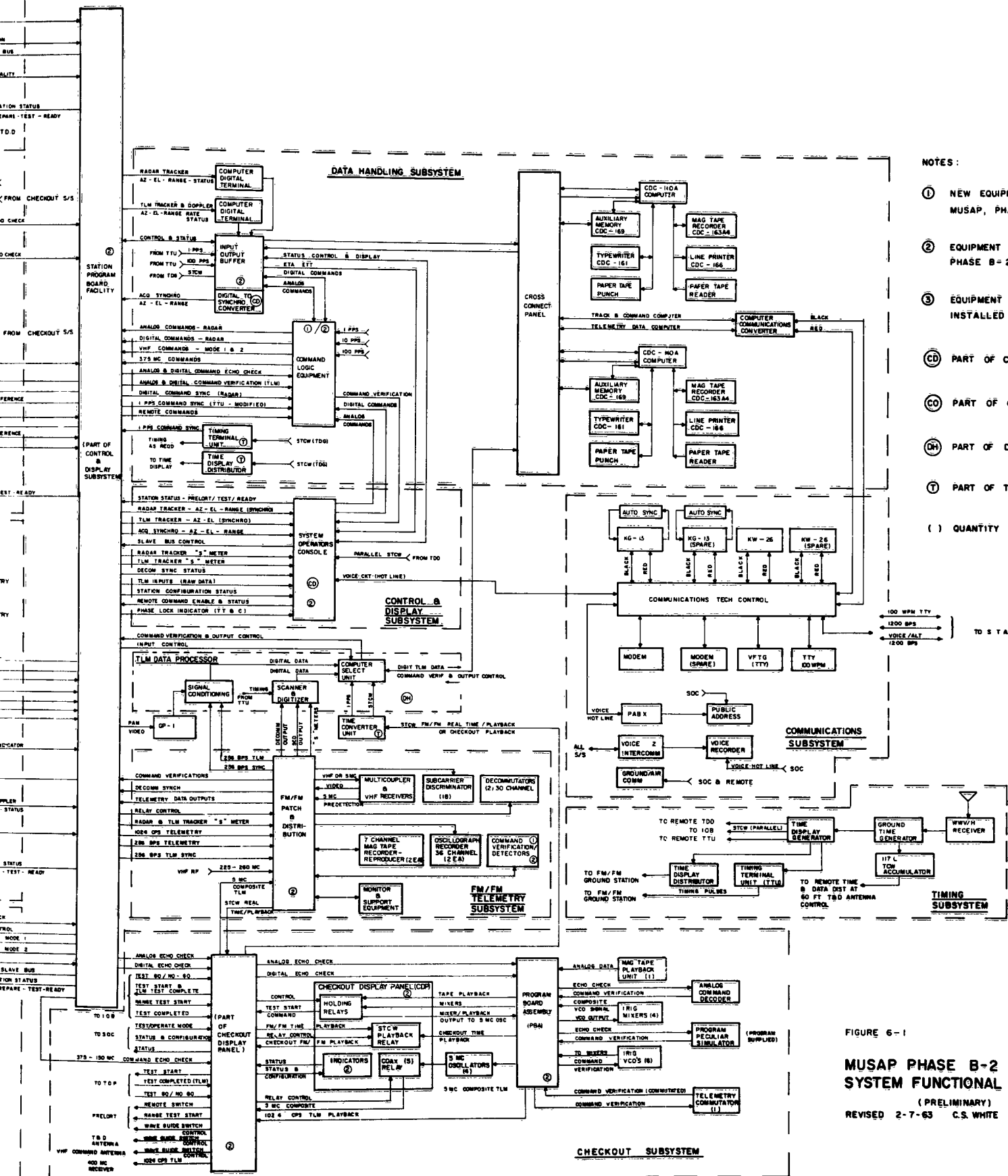
1. New equipment to be provided by MUSAP Phase B-2.
2. Equipment to be modified by MUSAP Phase B-2.
3. Equipment to be reactivated or installed by MUSAP Phase B-2.

6.2.2 Subsystem Divisions

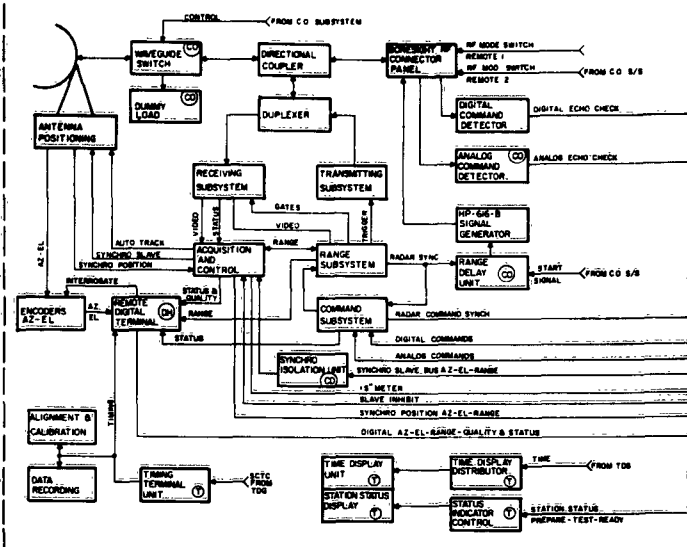
The individual subsystems are indicated within dashed lines; portions of the same subsystems which are separated from the main subsystems block and shown within other subsystem areas are designated by appropriate symbols, as follows:

- | | | |
|----|---|---------------------------------------|
| CD | - | Part of control and display subsystem |
| CO | - | Part of checkout subsystem |
| DH | - | Part of data handling subsystem |
| T | - | Part of timing subsystem. |

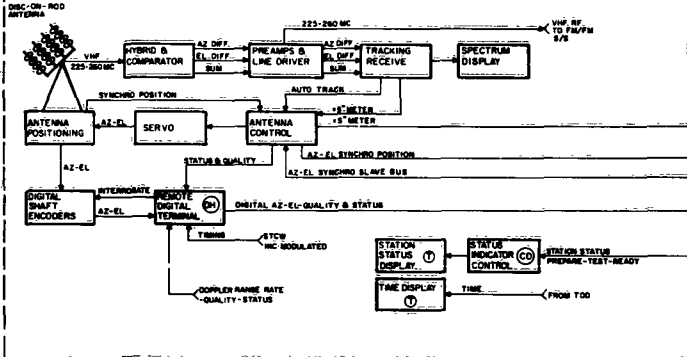




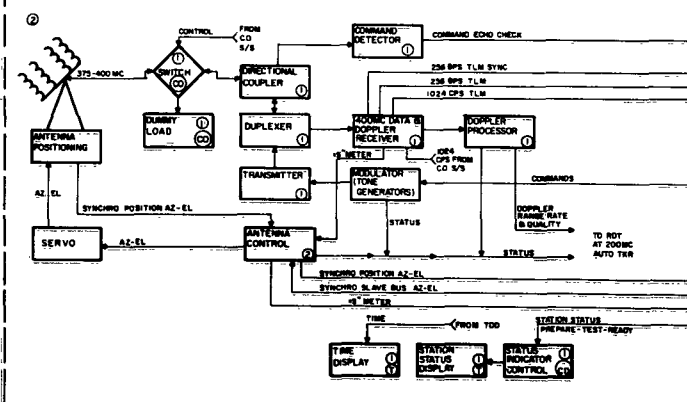
PRELORT S-BAND RADAR SUBSYSTEM



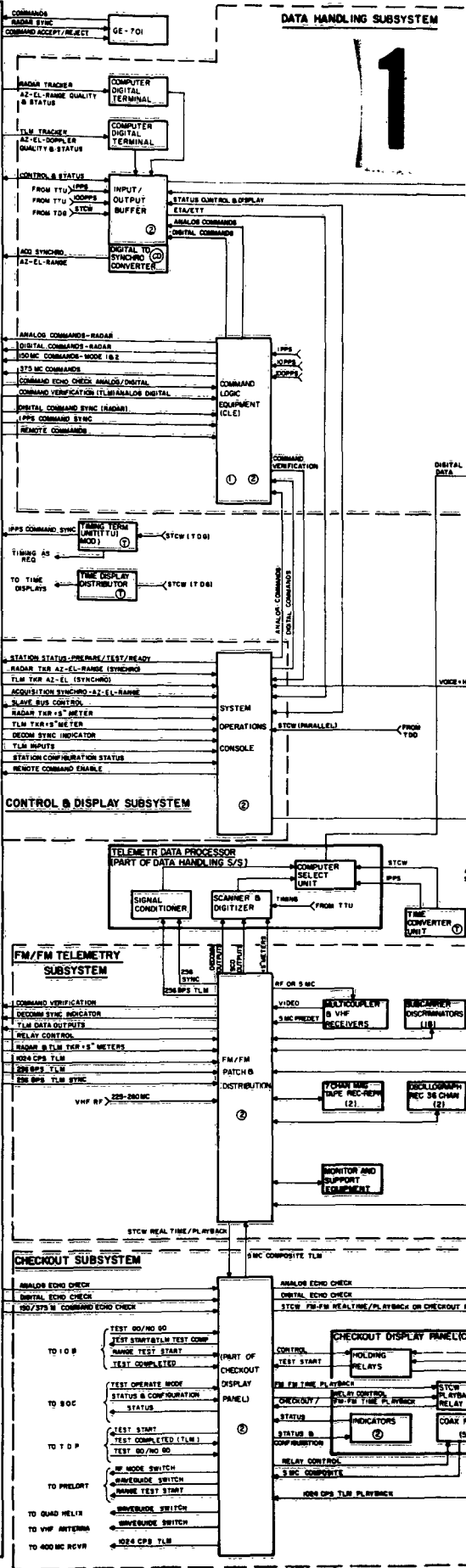
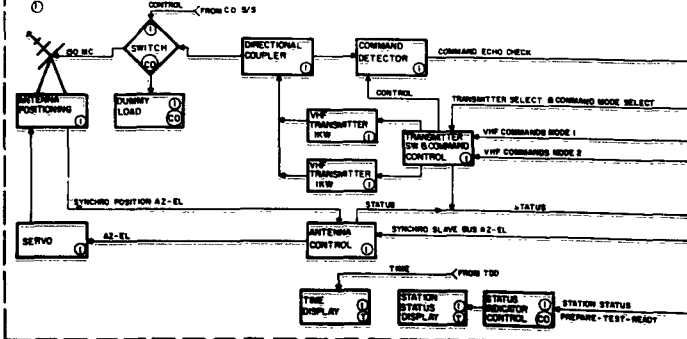
200 MC AUTO TRACKING ANTENNA SUBSYSTEM



QUAD-HELIX TELEMETRY & COMMAND SUBSYSTEM, 400 MC



VHF (150 MC) ANTENNA SUBSYSTEM



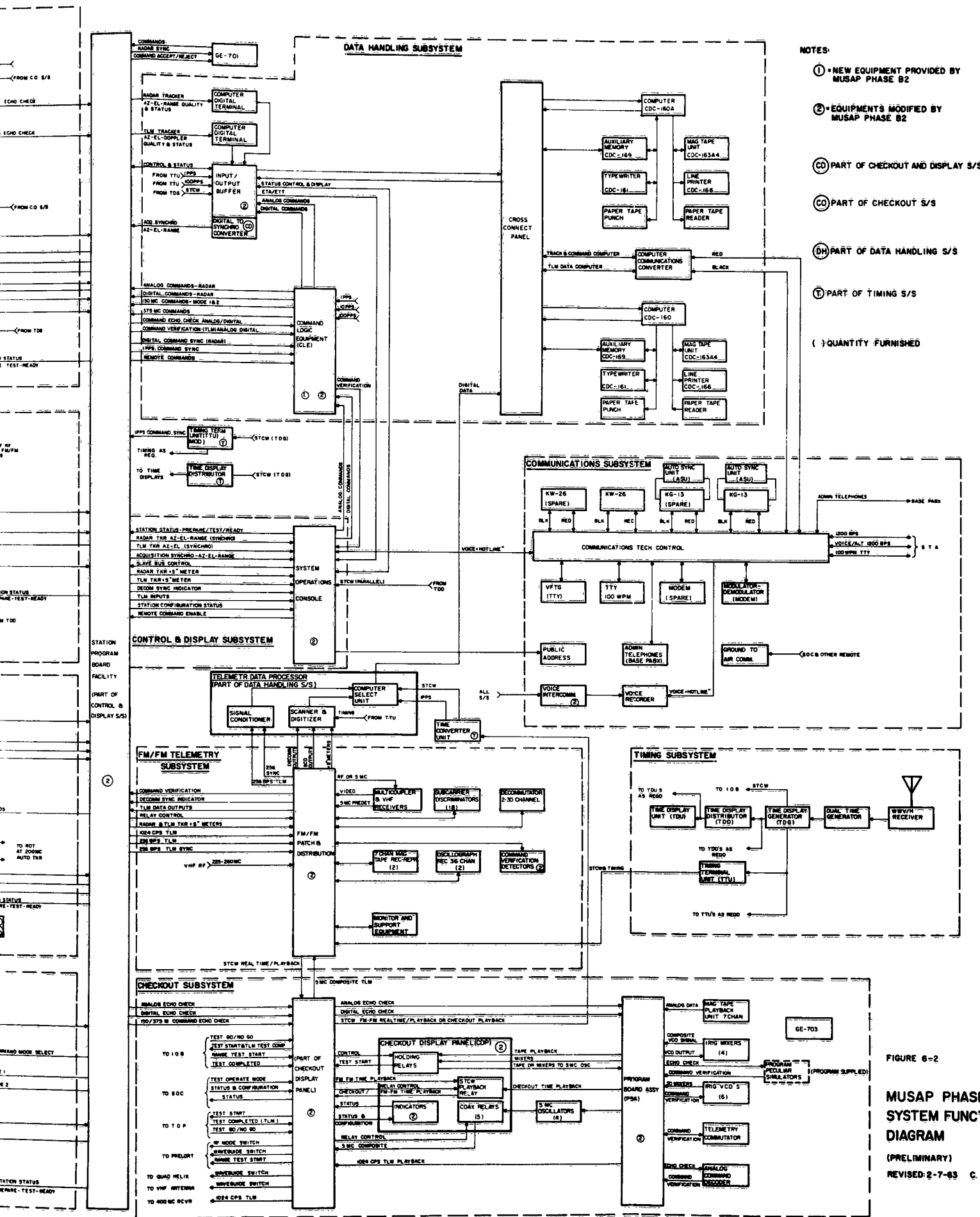


FIGURE 6-2

MUSAP PHASE B-2 (TTS) SYSTEM FUNCTIONAL BLOCK DIAGRAM

(PRELIMINARY)

REVISED: 2-7-63 C. S. WHITE

SECTION 7
NEW MAJOR EQUIPMENT

SECTION 7

NEW MAJOR EQUIPMENT

7.1 GENERAL

This section contains a listing, by station, of the major equipment that is required to implement the rehabilitation and modification of the Thule and Fort Greely tracking stations (TTS and FGS), and the addition of new equipment, as required, to satisfy MUSAP Phase B-2.

The equipment is presented in two major categories:

- Summary of the major cabinets (racks) of each subsystem indicating tentative make or buy decisions, source, and quantities required.
- A detailed equipment list, by station, indicating the chassis of each cabinet, possible vendors, and assembly drawings, as appropriate and available, for each subsystem.

7.2 SUMMARY OF MAJOR EQUIPMENT FOR MUSAP PHASE B-2

Table 7-1 is a summary of major equipment to be provided, installed and tested during MUSAP Phase B-2. Tentative make or buy decisions, and possible sources, together with quantities of the applicable cabinets for each of the subsystems are shown. Additional information is listed to reflect whether equipment is new, to be modified, or reactivated.

7.3 DETAILED EQUIPMENT LIST FOR MUSAP PHASE B-2

Tables 7-2 and 7-3 contain a detailed equipment list, by station, representing equipment components and/or chassis within each of the applicable racks for the various subsystems. The subsystems indicated in the tables include the following:

- VHF (150 mc) antenna subsystem
- 60-Ft telemetry, tracking, and commanding subsystem (TT&C)
- Quad-helix telemetry and command subsystem
- FM/FM telemetry subsystem

- Data handling subsystem
- Timing subsystem
- Control and display subsystem
- Boresight equipment
- Communications subsystem
- Checkout subsystem.

Table 7-4 contains rack and major component listing of equipment to be reactivated at FGS.

7.4 VHF (150 MC) ANTENNA SUBSYSTEM (FGS AND TTS)

7.4.1 General

For purposes of program planning, the 150-mc antenna subsystem at TTS and FGS will consist of the following major equipment:

1. Pedestal control equipment
2. VHF command antenna
3. VHF/AM transmitting equipment
4. Tone generating equipment
5. Directional coupler
6. Dummy load
7. Antenna switching equipment
8. Command verification detector
9. Alignment calibration and checkout.

7.4.2 Equipment Description

VHF Command Antenna. The VHF command antenna will be a crossed yagi, with RHC polarization, a nominal gain of 12 db, and a beamwidth of approximately 40 degrees at the one-half power points. This antenna may be a TACO Model D1365H or similar. The D1365H is identical with those now installed at VTS and NHS.

Pedestal and Control Equipment. The antenna will be a servo driven, two axis mount, capable of manual (local) or slaved operation. The antenna may be a Canoga PS2W-1D or equivalent. PS2W-1D pedestals are now installed at VTS and NHS.

VHF Transmitter. The VHF transmitting equipment will consist of dual transmitters, each operating over the range 120 mc to 150 mc. Front panel selection of two operating frequencies per transmitter will be provided to accommodate short turn around and diverse program command requirements. Retuning shall not be required for frequency assignments within 0.5 mc of one another. A dummy load will be provided as part of the transmitting equipment to preclude the possibility of interference with an operating vehicle under "test" conditions. The general characteristics of the VHF transmitters are shown below.

- Power out - 1 kw
- Range - 120 mc - 150 mc
- Stability - .001%
- Modulation - AM
- Bandwidth - ± 3 db from 300 to 10 k cps
- Distortion - not more than 10% total.

The transmitter may be an Aeronautical Communications 10V1-A or equivalent.

Tone Generator. The audio tone generator or generators will provide discrete tone outputs in the 4 to 7-kc range and will single tone modulate the command transmitter. Tones will be ordered by relay closures originating in the command logic equipment and controlled from the SOC. Tone frequencies will be provided in accordance with Aerospace criteria. Tone generators may be OVCO Mod. AD183123 or equivalent.

Command (Echo Check) Detector. The command (echo check) detector will be provided as a positive means of determining that the transmitted command was the intended command. The outputs of the tone filters of the command "echo check" detectors will be fed back to the command logic equipment for "echo check."

Directional Coupler. The directional coupler will be supplied to facilitate power measurement and provide an output to the command (echo check) detector.

Dummy Load. A dummy load will be provided to facilitate maintenance and test without radiating from the antenna.

Antenna Switching. An antenna switching unit will be provided for manual or remote switching of transmitters between the antenna, dummy load and command (echo check) detector.

Alignment Calibration and Checkout. All necessary test equipment required to successfully align, calibrate, monitor and maintain the subsystem will be supplied as part of the subsystem.

Tower Structure and Radome. The 150-mc command antenna and pedestal will occupy the tower structure and radome formerly used for the Verlor radar.

7.5 QUAD-HELIX TELEMETRY AND COMMAND SUBSYSTEMS (TTS)

7.5.1 General

For the purpose of the program plan, a 400-mc subsystem at TTS is proposed consisting of the following major equipment:

1. Quad-helix antenna and control (existing)
2. 400-Mc command (new)
3. 400-Mc telemetry/256 BPS (new)
4. 400-Mc Doppler (new).

7.5.2 Equipment Description

Use of Existing Antenna and Control Equipment. The antenna for the 400-mc subsystem will be the existing dual quad-helix. This antenna was originally designed to be used for both 400-mc and 200 to 250-mc systems. The existing 400-mc helices will be used and it is not anticipated that further modification will be required. The 200-mc helices now on the ground plane will be retained for mechanical balancing considerations only. The outputs of the 200-mc helices will be disconnected. The 400-mc antenna will be slaved to the synchro bus and will be a non-autotrack configuration. Existing antenna control and position indicators will be used.

New Equipment. All r-f hardware, preamps, filters, transmitting and receiving equipment for the 400-mc subsystem will be new equipment as shown in Table 7-1.

Boresight Equipment. Boresight equipment will not be required; however, closed loop testing of the receiving system will require a 400-mc source located on an existing boresight tower, i.e., boresight tower No. 2 now used with the Verlort.

7.6 60-FOOT TELEMETRY, TRACKING AND COMMANDING SUBSYSTEM (TT&C) (FGS)

7.6.1 General

This paragraph defines the effort necessary to modify the 60-ft. T&D antenna and its associated control equipment and the new equipment required to provide the following operational capabilities at FGS:

- 375/400-mc autotrack, including both command and receiving functions
- 2.2 - 2.3 gc autotrack and telemetry.

7.6.2 Equipment Description

Specifically, the following modifications will be performed. (It should be noted that the effort required to accomplish these modifications will, as a necessary corollary, also resolve all outstanding requests for material review (RMR) involving previous equipment deficiencies and/or performance deviations.)

Antenna Modifications

1. Feed Assembly. A new feed assembly which incorporates a 375/400-mc monopulse array, as well as 2.2 - 2.3 gc conscan, will be provided. This feed will be fabricated to an already existing design, and will replace the feed assembly presently installed on the antenna. The existing 215-260 mc feed will not be disturbed.
2. Other New R-F Equipment. In addition to the feed, the following other new r-f equipment will be supplied:
 - a. One monopulse comparator
 - b. One 400-mc bandpass filter group (125384)
 - c. One 375/400-mc diplexer (125385)

- d. Two 375-bandstop filters (125378)
- e. Two 375/VHF duplexers (125378)
- f. Two low pass filters (126958)
- g. Two 400-mc bandstop filters (135411)
- h. One 375-mc bandpass filter (127224)
- i. One diplexer assembly (126300)
- j. One 300-mc low pass filter (126226)
- k. One Doppler exciter output spectrum filter
- l. Preamplifier, 400 mc, parametric
- m. Preamplifier, 400 mc, monopulse
- n. Generator, noise
- o. Amplifier, power, 1 kw (375 mc)

3. Servo Equipment. The servo equipment will be modified as necessary to replace the present search scan function with the required combined fan-spiral scan functions. The mode switching logic will be redesigned to accomodate foot switching of the local manual and autotrack modes. Modifications will be installed to permit synchro slaving of the antenna. (The necessary hardware to accomplish this has already been delivered to the site.)

4. Power Distribution and Slip Ring Assembly. The power distribution system will be redesigned to meet the requirements for separation of technical and utility power. This will require the addition of one 100 ampere feeder for 115 VAC single phase and two circuit breakers.

The number of slip rings must also be increased. This will be accomplished by the addition of a supplementary slip ring assembly which will provide 20 more slip rings.

5. Structural Modifications. Mounting facilities and support members will be added to the reflector structure to permit mounting the 375-mc power amplifier above the axis of rotation. As a part of this effort, the required counterweighting and balancing will be accomplished.

375/400 Mc Autotrack, Command and Reception. To implement this capability, the new equipment as outlined in Para. 2b-2j of Table 7-1 will be required.

2.2 - 2.3 Gc Autotrack and Telemetry. This capability presently exists, but requires redesign of some receiver chassis to obtain the required turning range. The affected chassis will be replaced by newly designed units.

Antenna Control Equipment. Two alternatives exist with regard to modification of the antenna control equipment: (1) To add a bay to the existing console, or (2) To provide a new console.

Since there are numerous additional monitor and control functions (primarily associated with the 375/400-mc equipment) and changes to previously implemented functions (position indicators, monitors, mode switching, slaving, etc.), a choice between these alternates must await the outcome of a value analysis. Although the addition of a bay to the existing console presently appears to be the more desirable, the alternative cannot at this time be disregarded.

7.7 OTHER ASSOCIATED SUBSYSTEMS (FGS AND TTS)

Modifications and/or new equipment will be provided for the following subsystems at both TTS and FGS:

- FM/FM telemetry subsystem
- Data handling subsystem
- Control and display subsystem

- Timing subsystem
- Boresight equipment
- Checkout subsystem
- Communications subsystems.

VENDORS CODE LEGEND

HP	Hewlett Packard Company
PA	Panoramic Electronics Incorporated
PH	Philco WDL
TA	Technical Appliicance Corporation
MT	Motorola Corporation
FL	Fluke Manufacturing Company
WD	Western Devices
SI	Sierra Electronics Corporation
MA	Manson Laboratories, Inc.
C	Canoga Electronics Corporation
AU	Automation Industries
ACC	Aero Communications Company
AI	Advanced Measurements Corporation
B	Boonton Radio Corporation
GFP	Government Furnished Property
WE	Western Electric Company

TABLE 7-1

Summary of Major Equipment for MUSAP Phase B-2*

<u>Nomenclature</u>	<u>Tentative Make or Buy</u>	<u>See Legend</u>	<u>Source</u>	<u>Quantity</u>		
				<u>FGS</u>	<u>TTS</u>	<u>Total</u>
1. VHF (150 MC) Antenna Subsystem	M	N	PH	1	1	2
a. VHF Command Transmitter	B	N	ACC	2	2	4
b. Antenna Control Equip- ment	B	N	C	1	1	2
c. Command (Echo Check) Detector and Tone Generators	M	N	PH	1	1	2
d. Radome	--	N	GFP	1	--	1
e. Switching Panel	M	N	PH	1	1	2
f. Crossed Yagi Antenna	B	N	TE	1	1	2
g. Two-Axis Pedestal	B	N	C	1	1	2
2. 60 Foot TT&C Subsystem	M (Partial Exists)	R/M	PH	1	--	1
a. Antenna Assembly 400 MC	M	N	PH	1	--	1
b. Doppler Receiver Monitor, 400 MC	M	N	PH	1	--	1
c. Exciter Monitor, 400 MC	M	N	PH	1	--	1
d. 15 W Transmitter Exciter	M	N	PH	1	--	1
e. 400 MC Frequency Control	M	N	PH	1	--	1
f. 400 MC Doppler Receiver	B	N	MO	2	--	2

Legend:

N - New

M - Modify

R - Reactivate

*Equipment to be furnished, modified or reactivated

<u>Nomenclature</u>	<u>Tentative Make or Buy</u>	<u>See Legend</u>	<u>Source</u>	<u>Quantity</u>		
				<u>FGS</u>	<u>TTS</u>	<u>Total</u>
g. RF Filter Assembly	M	N	PH	1	--	1
h. Doppler Data Converter	M	N	PH	1	--	1
i. Tracking and Data Console (Existing)		M	PH	1	--	1
j. Test, Checkout and Cali- bration, 400 MC	M	N	PH	1	--	1
3. Quad-Helix Telemetry and Command Subsystem, 400 MC	M (Partial Exists)	M	PH	--	1	1
a. Antenna Assembly 400 MC	(Partial Exists)	M/N	PH	--	1	1
b. Doppler Receiver Monitor, 400 MC	M	N	PH	--	1	1
c. Exciter Monitor, 400 MC	M	N	PH	--	1	1
d. 15 W Transmitter Exciter, 400 MC	M	N	PH	--	1	1
e. 400 MC Frequency Control	M	N	PH	--	1	1
f. 400 MC Doppler Receiver	B	N	MO	--	2	2
g. RF Filter Assembly, 400 MC	M	N	PH	--	1	1
h. Doppler Data Converter, 400 MC	M	N	PH	--	1	1
i. Test, Checkout and Cali- bration, 400 MC	M	N	PH	--	1	1
j. Mobile Test Equipment, 400 MC	M	N	PH	--	1	1
4. FM/FM Telemetry Subsystem	Existing	M	PH	1	1	2
a. VHF Command Verification Detector, 150 MC	M	N	PH	1	1	2
b. VHF Command Verification Indicator, 150 MC	M	N	PH	1	1	2

<u>Nomenclature</u>	<u>Tentative Make or Buy</u>	<u>See Legend</u>	<u>Source</u>	<u>Quantity</u>		
				<u>FGS</u>	<u>TTS</u>	<u>Total</u>
5. Data Handling Subsystem	Existing	M	PH	1	1	2
a. Command Logic Equip.	M	N	PH	1	1	2
6. Control & Display Subsystem	Existing	M	PH	1	1	2
a. Station Operators Console (Kit)	Existing	M	PH	1	1	2
b. Station Program Board (Kit)	Existing	M	PH	1	1	2
7. Timing Subsystem	Existing	M	PH	1	1	2
a. Time Display Indicator Unit	M	N	PH	1	2	3
b. Time Display Distri.	M	N	PH	-	1	1
c. Station Status Control Unit	M	N	PH	1	1	2
d. Station Status Control Unit, 117L	M	N	PH	1	-	1
8. Boresight Equipment 400 Mc.	M	N	PH	1	-	1
a. Near Field Rack Equipment (Boresight, 400 Mc)	M	N	PH	1	1	2
b. Near Field Equipment (Tower Mounted-400 Mc)	M	N	PH	1	1	2
9. Checkout Subsystem	Existing	M	PH	1	1	2
a. Checkout Program Board	M	N/M	PH	1	1	2
b. Modification Kits (823-626 Programs)	M	N	PH	1	1	2
c. RF Dummy Loads & Controls	B	N	-	2	2	4
10. Communications Subsystem	Existing	M	GFP	1	-	1
a. Net Access Comm. Panels (3 ea.)	M	N	GFP	1	-	1

TABLE 7-2
THULE TRACKING STATION (TTS)
DETAILED EQUIPMENT LIST FOR MUSAP-PHASE B-2
(PRELIMINARY)

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
1	N		VHF (150 Mcs) Antenna Subsystem	PH	
2	N		VHF Command Transmitter	ACC	
3	N		VHF Command Transmitter	ACC	
4	N		Antenna Control Equipment	ACC	
	N		Command (Echo Check) Detector & Tone Generators	PH	
	N		Command Detector	PH	
	N		Tone Generator No. 1	AU	
	N		Tone Generator No. 2	AU	
	N		Switching Panel	PH	
	N		Crossed Yagi Antenna	TA	
	N		Two Axis Pedestal	C	
7-14	M		Quad-Helix Telemetry & Command S/S	PH	
	M		Antenna Assembly	PH	
	N		Preamplifier, 400 Mc, Para. RF Assembly (preamplifier mixer)		
	N		Generator, Noise		
	N		Amplifier, Power, 1 Kw		
	N		Diplexers and Filters		
	N		Dummy Load		
1	M	CE-306A	Test, Checkout & Calibration, 400 Mc	PH	136917-03
	N	IM-13	Panel, AC Power-Elapsed Time	HP	126717-01
	N	MB-5	VSWR Indicator	HP	126018-01
	N	ID-85	Meter, Power	HP	126013-01
	N	ID-86	Voltmeter, Vacuum Tube Voltmeter, Vacuum Tube	HP	126012-01

LEGEND:

M - Modify

N - New

PHILCO

WESTERN DEVELOPMENT LABORATORIES

<u>BACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
2	N	ID-84	Voltmeter, Differential	FL	126015-01
	N		Meter, Noise Figure	PH	
	N		Switch, Noise Figure Meter	WD	123905-57
	N		Drawer	PH	140980-01
	N	HD-41	Panel, Blank	WD	
	N		Air Distribution System		126917-03
	N	CE-306A	Monitor, 400 Mc Doppler Receiver	PH	
	N		Panel, AC Power-Elapsed Time	WT	
	N		Simulator, Doppler	PH	
	N		Panel, Termination	PH	
	N	IP-11	Analyzer, Spectrum	PA	126020-01
	N	FR-18	Counter, Frequency	HP	124929-01
	N	RD-47	Recorder, Digital	HP	124950-01
	N	PP-149	Power Supply, Spectrum Analyzer	PA	126721-01
3	N		Panel, Blank	PH	123905-57
	N	HD-41	Air Distribution System	WD	140980-01
	N		Monitor, Exciter		
	N	CE-306A	Panel, AC Power-Elapsed Time	PH	136917-03
	N		Panel, Termination	PH	
	N		Panel, Blank	PH	123905-60
	N		Meter, Deviation	AI	
	N		Simulator, Telemetry		
	N		Generator, Command Tone	PH	
	N	CE-209B	Control, Power Amplifier	SI	
4	N		Receiver, Command Verification	PH	123905-56
	N		Panel, Blank	PH	125264-01
	N		Drawer	PH	123905-57
	N	HD-41	Panel, Blank	WD	140980-01
	N		Air Distribution System		
	N	CE-306A	15 W Transmitter, Exciter	PH	136917-03
	N		Panel, AC Power-Elapsed Time	PH	123905-58
	N		Panel, Blank	PH	
	N		Amplifier, Power, Intermediate	PH	
	N	ID-81	Monitor Assembly, UHF Doppler	PH	125834-01
	N	TR-33	Transmitter Assembly, UHF Doppler	PH	125837-01
	N		Switch, Exciter, Transfer	PH	
	N	ID-81	Monitor, Assembly, UHF Doppler	PH	125834-01
	N	TR-33	Transmitter Assembly, UHF Doppler	PH	125837-01
	N		Amplifier, Power, Intermediate	PH	
	N		Panel, Blank	PH	123905-07
	N	HD-41	Air Distribution System	WD	140980-01

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WESTERN DEVELOPMENT LABORATORIES

<u>PACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
5	N	CE-306A	400 Mc Frequency Control	PH	136917-03
	N		Panel, AC Power-Elapsed Time	MA	
	N		Oscillator, Local	MA	
	N		Oscillator, Local	PH	123905-56
	N		Panel, Blank	PH	123905-56
	N		Panel, Blank	PH	123905-56
	N		Panel, Blank	PH	
	N		Panel, Termination	PH	
	N		Selector, Frequency	PH	
	N		Selector, Mode	PH	
	N		Panel, Blank	PH	123905-56
	N		Panel, Termination	PH	
	N		Panel, Blank	PH	
	N	MD-16	Synthesizer, Electronic Frequency	PH	123905-56
	N		Standard, Frequency	MA	129611-01
	N		Panel, Blank	MA	
	N		Panel, Blank	PH	123905-57
	N		Air Distribution System	PH	123905-57
	N	HD-41	Receiver, A, 400 Mc Doppler	WD	140980-01
	N		Panel, Blank	PH	
	N		Demodulator, Telemetry	PH	123905-66
	N	GV-71	Extractor, Doppler	MT	
	N	RV-47	Receiver, Reference	MT	123951-01
	N		Panel, Blank	MT	123949-01
	N		Control, Paramp	PH	123905-58
	N	PP-147	Power Supply, Receiver	MT	
	N		Panel, Blank	MT	123952-01
	N	HD-41	Air Distribution System	PH	123905-58
	N		Receiver B, 400 Mc Doppler	WD	140980-01
	N		Panel, Blank	PH	
	N		Demodulator, Telemetry	PH	123905-56
	N	CV-71	Extractor, Doppler	MT	
	N	RV-47	Receiver, Reference	MT	123951-01
	N		Receiver Control & Switch	MT	123949-01
	N		Panel, Blank	MT	
	N		Power Supply, Receiver, Monopulse	PH	
	N		Panel, Blank	MT	
	N	HD-41	Air Distribution System	PH	123905-57
	N		RF Filter Assembly	WD	140980-01
	N		Panel, Blank	PH	
	N		Panel, Blank	PH	128976-01
	N	FL-35A	Filter, Band Pass, Transmitting Arm	PH	128977-01
	N			PH	127224-03

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SEE LEGEND	MODEL	TITLE	VENDOR	ASSEMBLY DRAWING
N	FL-35A	Panel, Blank	PH	128977-01
N		Panel, Blank	PH	128978-01
N		Filter, Band Stop	PH	125379-01
9-----		Doppler Data Converter (Processor)		
10-----		Mobile Test Cabinet		
N		Oscilloscope		
N		Voltemeter		
N		Signal Gen.		
N		Oscillator		
N		Oscillator		
N		Air Distribution System		
N	ND-41			
M		FM/PM Telemetry Subsystem	PH	136767-01
N		VHF Command Verification Detector	PH	
A		150 Mc		
		VHF Command Verification Indicator	PH	
		150 Mc		
M		Data Handling Subsystem	PH	
N		Command Logic Equipment	PH	
N		Control & Display Panel	PH	
N		Logic Drawer	PH	
N		Power Distribution	PH	
N		Panel, Blank (4 ea.)	PH	
N		Power Supply	PH	
N		Air Distribution	PH	
N		RTD Modification Kit	PH	
M		Control & Display Subsystem		
M		Station Operators Console (Kit)	PH	140842-01
M		Station Program Board (Kit)	PH	
N/M		Synchro Data Link Equipment	PH	
M		Timing Subsystem	PH	
N	WDL-ID-157	Time Display Indicator (ZEM)	PH	141242-01
N		Station Status Control Unit	PH	
N	WDL-CV-116	Time Display Distributor	PH	142171-01
M		Checkout Subsystem	PH	
N/M		Checkout Program Board	PH	

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
	N/M		Modification Kits (823-626)	PH	
	N		RF Dummy Load & Controls (ZEA)		
	N		<u>Boresight Equipment 400 Mc</u>	PH	
	N		Near Field Equipment Rack	PH	
	N		Signal Generator, HP8614	HP	
	N		Signal Generator, 202J	B	
	N	TR-41	Transmitter, Boresight		
	N	SG-44	Signal Generator, 1 Kc		
	N		Near Field (Tower Mounted (400 Mc))	PH	
	N				
	N		Coaxial Switch		
	N		Screened Yagi, 400 Mc		
	N				

TABLE 7-3
PORT GREELY TRACKING STATION (FGS)
DETAILED EQUIPMENT LIST FOR MUSAP-PHASE B-2
(PRELIMINARY)

<u>BACK NO.</u>	<u>SEE</u> <u>LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
1	N		<u>VHF (150 Mcs) Antenna Subsystem</u>	PH	
2	N		VHF Command Transmitter	ACC	
3	N		VHF Command Transmitter	ACC	
4	B		Antenna Control Equipment	C	
	N		VHF Command (Echo Check)		
			Detector & Tone Generators		
	N		Command Detector	PH	
	N		Tone Generator No. 1	AU	
	N		Tone Generator No. 2	AU	
	N		Switching Panel	PH	
	N		Crossed Yagi Antenna	TA	
	N		Two Axis Pedestal	C	
	N		Radome 26 $\frac{1}{2}$ '		
	R/M		<u>60' TTSC Subsystem *</u>		
	M		Antenna Assembly, 400 Mc		
	N		Preamplifier, 400 Mc Paramplifiers		
	N		Preamplifier, 400 Mc Monopulse	MT	
	N		Generator, Noise		
	N		Amplifier, Power, 1 KW		
	N		400 Mc RF Feed		
	N		Diplexers & Filters		
	N		Comparator		
	M		Tracking & Data Console (Modify Existing)		

119892-01

LEGEND:

R = Reactivate

M = Modify

N = New

* Telemetry, Tracking, and Commanding

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
1	R/N	CE-306A	Test, Checkout & Calibration, 400 Mc	PH	136917-03
	N	IM-13	Panel, AC Power-Elapsed Time	HP	126717-01
	N	ME-5	VSWR Indicator	HP	126012-04
	N	ID-85	Meter, Power	HP	126013-01
	N	ID-86	Voltmeter, Vacuum Tube	HP	126012-01
	N	ID-84	Voltmeter, Vacuum Tube	FL	126015-01
	N		Voltmeter, Differential		
	N		Meter, Noise Figure	PH	
	N		Switch, Noise Figure Meter	WD	
	N		Drawer	PH	123905-57
	N	HD-41	Panel, Blank	WD	140980-01
2		CE-306A	Air Distribution System	PH	126917-02
	N		Monitor, 400 Mc Doppler Receiver	MT	
	N		Panel, AC Power-Elapsed Time	PH	
	N		Simulator, Doppler	PA	126029-01
	N	IP-11	Panel, Termination	PA	124929-01
	N	FR-18	Analyzer, Spectrum	HP	124950-01
	N	RD-47	Counter, Frequency	HP	126721-01
	N	PP-149	Recorder, Digital	PA	123905-57
	N		Power, Supply, Spectrum Analyzer	PH	140980-01
	N	HD-41	Panel, Blank	WD	
	N		Air Distribution System		
	N		Monitor, Exciter	PH	136917-03
3		CE-306A	Panel, AC Power-Elapsed Time	PH	
	N		Panel, Termination	PH	
	N		Panel, Blank	PH	133905-60
	N		Meter, Deviation	AI	
	N		Simulator, Telemetry	PH	
	N		Generator, Command Tone	PH	
	N		Control, Power Amplifier	SI	
	N		Receiver, Command Verification	PH	
	N		Panel, Blank	PH	123905-56
	N		Drawer	PH	125264-01
	N	HD-41	Panel, Blank	PH	123905-57
	N		Air Distribution System	WD	140989-01
4		CE-306A	15 W Transmitter, Exciter	PH	136917-03
	N		Panel, AC Power-Elapsed Time	PH	123905-58
	N		Panel, Blank	PH	
	N		Amplifier, Power, Intermediate	PH	125834-01
	N	ID-81	Monitor, Assembly, UHF Doppler	PH	125837-01
	N	TR-33	Transmitter Assembly, UHF Doppler	PH	123905-07
	N		Panel, Blank	PH	

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
5	N	HD-4R	Air Distribution System	WD	140980-01
	N		400 Mc Frequency Control	PH	
	N	CE-306A	Panel, AC Power-Elapsed Time	MA	136917-03
			Oscillator, Local		
	N		Panel, Blank	PH	123905-56
	N		Panel, Blank	PH	123905-56
	N		Panel, Blank	PH	123905-56
	N		Panel, Termination	PH	
	N		Selector, Frequency	PH	
	N		Selector Mode	PH	
6	N		Panel, Blank	PH	123905-56
	N		Panel, Termination	PH	
	N		Panel, Blank	PH	
	N	MD-16	Synthesizer, Electronic Frequency	PH	123905-56
	N		Standard, Frequency	MA	123905-56
	N		Panel, Blank	MA	129611-01
	N		Panel, Blank	PH	
	N		Air Distribution Systems	PH	123905-37
	N	HD-41	Receiver #1, 400 Mc Doppler	PH	123905-57
	N		Panel, Blank	WD	140980-01
7	N		Demodulator, Telemetry	PH	123905-06
	N	CY-71	Extractor, Doppler	MT	
	N	RV-47	Receiver, Reference	MT	123951-01
	N		Panel, Blank	MT	123949-01
	N	RV-48	Receiver, Error, Monopulse, 400 Mc	PH	123905-58
	N	RV-48	Receiver, Error, Monopulse, 500 Mc	MT	123950-01
	N		Control, Paramp	MT	123905-01
	N	PP-147	Power, Supply Receiver	MT	123952-01
	N		Panel, Blank	PH	123905-58
	N	HD-51	Air Distribution System	WD	140980-01
	N		Receiver, #2, 400 Mc Doppler		
	N		Panel, Blank	PH	123905-56
	N		Demodulator, Telemetry	MT	
	N	CV-71	Extractor, Doppler	MT	123951-01
	N	RV-47	Receiver, Reference	MT	123949-01
	N		Receiver, Control & Switch	MT	
	N	RV-48	Receiver, Error	MT	123950-01
	N	RV-48	Receiver, Error	MT	123950-01
	N		Panel, Blank	PH	123905-58
	N		Power Supply, Receiver, Monopulse	PH	
	N		Panel, Blank	MT	123905-57
	N	HD-41	Air Distribution System	WD	140980-01

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
8	R/N	FL-35A	RP Filter Assembly	PH	128976-01
	N		Panel, Blank	PH	128976-01
	N		Panel, Blank	PH	128977-01
	N		Filter, Band Pass Transmitting Arm	PH	127224-03
	N		Panel, Blank	PH	123977-01
	N		Panel, Blank	PH	128978-01
	N		Filter, Band Stop	PH	125379-01
	N		Doppler Data Converter (Chassis)		
	M		FM/FM Telemetry Subsystem	PH	136767-01
	N		VHF Command Verification Detector,	PH	
	N		150 Mc		
	N		VHF Command Verification Indicator,	PH	
	N		150 Mc		
1	N		Data Handling Subsystem	PH	
	N		Command Logic Equipment	PH	
	N		Control & Display Panel	PH	
	N		Logic Drawer	PH	
	N		Power Distribution	PH	
	N		Panel, Blank (4 ea.)	PH	
	N		Power Supply	PH	
	N		Air Distribution	PH	
	M		Control & Display Subsystem	PH	
	M		Station Operators Console (Kit)	PH	140842-01
	M		Station Program Board (Kit)	PH	
	N/M		Synchro Data Link Equipment	PH	
	M		Timing Subsystem	PH	
	N		Time Display Indicator Unit	PH	
	N		Station Status Control Unit	PH	
	N		Station Status Control Unit, 117	PH	141242-01
	M		Communication Subsystem	PH	
	N		Net Access Communications Panel	WE	
	N		(3 ea.)		
	N		Net Access Communications Jackbox	WE	
	N		(3 ea.)		
	N		Installation Hardware Kit	WE	

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WESTERN DEVELOPMENT LABORATORIES

<u>RACK NO.</u>	<u>SEE LEGEND</u>	<u>MODEL</u>	<u>TITLE</u>	<u>VENDOR</u>	<u>ASSEMBLY DRAWING</u>
	M		<u>Checkout Subsystem</u>	PH	
	N/A		Checkout Program Board	PH	
	N		Modification Kits (823-626)	PH	
	N		RF Dummy Loads & Controls (2 ea.)	PH	
	N		<u>Boresight Equipment 400-Mc</u>	PH	
	B		Near Field Equipment Rack	PH	
	N		Signal Generator, HP8614	HP	
	N		Signal Generator, 202J	B	
	N		Transmitter, Boresight		
	N		Signal Generator, 1 Kc		
	N		Near Field (Tower Mounter (400 Mc)	PH	
	N		Boresight Tower		
	N		Aircraft Warning & Light Assembly		
	N		Target, Optics, 200 W		
	N		Coaxial Switch		
	N		Target, Optic, Collimating		
	N		Screened Yagi, 400-Mc		
	N				

Table 7-4

Existing Equipment At FGS To Be Activated
During MUSAP Phase B-2

<u>MODEL</u>	<u>TITLE</u>
0A-34	Cabinet Assembly Terminal
0A-23	Cabinet Assembly Intermediate Servo
0A-24	Cabinet Assembly, Power Supply
0A-25	Cabinet Assembly, Power Supply
0A-76	Filterings & Switching Group, RF (Diplexer)
0A-75	UHF Parametric Amplifier Diplexer
0A-10	Detection and Distribution
0A-40	Recorder, Visual
0A-31	Console, Tracking & Data (B/R)
	Antenna, T & D Mod AS008 Including
	Reflector, 60' Parabolic Reflector
	Pedestal & Drive Mechanism
	Gimbal Ring & Assy
	Antenna Servo System
	Feed & Support Assy
	Preamplifier, VHF-PR-203 (2 each)
	Parametric Amplifier, UHF Dual S/L Band
	Shaft Encoders, Wayne Geo.
	Tower, Maintenance

<u>MODEL</u>	<u>TITLE</u>
	Radome Heating System
	Switching, Coaxial, RF Motorized
	Radome, 110 Ft
0A-57	Converter Group, Frequency
0A-32	Receiver, Radio Telemetry (UHF) (2 each)
0A-33	Receiver, Radio Tracking (1 UHF) (2 each)
0A-84	Driver, Remote Time & Display
0A-44	Distribution Timing & Data Remote (RT & DD)
0A-43	Antenna Slave Data Group (ASDE)
0A-42	Control, Antenna Slave Data (ASDE)
0A-50	Accumulator, Time Code Work (MGTE)
0A-105	Sync. Separator & Sequencer (PAM)
0A-106	Sync. Separator & Sequencer (PAM)
0A-107	Power Monitor & Control (PAM)
0A-108	Digitizer & Record Reproducer (PAM)

SECTION 8
SITE FACILITIES REQUIREMENTS

SECTION 8

SITE FACILITIES REQUIREMENTS

8.1 A&E DESIGN CRITERIA (FORT GREELY TRACKING STATION)

8.1.1 Introduction

The purpose of this section is to provide Architectural and Engineering (A&E) facility design criteria for Phase B-2 of MUSAP at FGS. The scope of this section will cover the existing transmitting and receiving areas for FGS.

Location. FGS is located about 90 miles south of Fairbanks, Alaska. A site layout is shown in Fig. 8-1.

Criteria. The criteria is intended to present as fully as possible the specific A&E requirements for Phase B-2.

8.1.2 Existing A&E Criteria

The existing A&E criteria for FGS may be used as reference:

- A&E Design Criteria, Multiple Satellite Augmentation Ground Station at the Fort Greely Station, Rev. 20 June 1962.

8.1.3 New A&E Criteria for T&D Building No. 2, FGS

Civil Engineering. The existing civil engineering layout for the T&D area is adequate for Phase B-2. A new boresight tower for the T&D antenna will be located 2000 feet from the T&D No. 2 antenna. See Fig. 8-1 for the location of the new tower. No other changes are required.

Architectural. The partition between rooms 102 and 106 will have to be removed to allow space for the additional racks of equipment. See Fig. 8-2 for the location and extent of work. See the following

heading for structural aspects of the wall removal. A cable trench will be cut into the floor in Room 102 to provide cable runs to the relocated console. An additional trench will be run from the substation inside the T&D No. 2 antenna support structure and the T&D No. 2 building. This will run new power conduit and allow for future expansion of power and instrumentation cabling. See Fig. 8-2 for the location and details of trenches.

Structural

1. General. The removal of the wall between rooms 102 and 106 will require a header beam to take the loading of the wall above and the wood ceiling joints that were tied into the wall. The trenches referred to in the architectural paragraphs above shall be provided with adequate reinforcing to tie into the existing floor. The cover plates in the building will be adequate to hold nominal personnel traffic and any electronic equipment. The maximum design load should be 200 PSF or 1000 pounds, concentrated. The cover over the trench from the substation to the building will be adequate to take the load applied by a truck with a 4000 lb. wheel load with single axle. See Fig. 8-2 for recommended trench details. The installation contractor will verify the location of existing conduits prior to the cutting of concrete slabs.
2. Boresight Tower. A new boresight tower is required for the TT&C 60-ft. antenna. The tower will meet WDL Specification No. 98-2237-02 as well as the following requirements.

Distance from Antenna. 2000 ft.

Height of boresight tower. (The boresight target (approximately 350 feet) shall be placed plus 8-degrees from the centerline of the antenna to the center line of the target board.)

Type of tower Steel (A-7) guyed, rigid.

Deformation No permanent deformation
will result from winds of
125 knots.

Lights Obstruction lights are required

Targets The tower will be capable
of supporting four optical
targets, yagⁱ
antenna
one coaxial switch and a
maximum of 1-5/8-inch
(diameter) spirolite
cable. The estimated
total area is estimated
at eight square feet
located at the top 20 feet
of the tower.

Mechanical The additional equipment
being added to the T&D
No. 2 building will add
20,420 BTU/hr. to the total
building load. The
existing load from the
electronic equipment is
estimated at 96,000 BTU/hr.
The existing equipment is
tied in directly with the
exhaust duct system; there-
fore the existing air
conditioning system should
be adequate to handle the
increased heat load. The
new equipment will discharge
heat directly into the room.

Electrical The existing power panel in the T&D Building No. 2 is being used to capacity. It is therefore necessary to provide a new power panel which will take power from the existing substation in the T&D No. 2 antenna support structure. The conduit carrying the power cable will be placed in the cable trench as mentioned above. See Fig. 8-2 for the location of the trench and Fig. 8-3 for the location of the new power panel. The power required is 120/208 volts, 3 ϕ , 4 wire, with a 200 amp. main breaker. A minimum conduit of 2-inch diameter will be required.

8.1.4 New A&E Criteria for the Transmitting Area, FGS

Introduction. The Phase B-2 equipment installation will include the following (See Fig. 8-4):

1. Four racks of equipment to be located in Room 103 of the command transmitter building.
2. One VHF command antenna to be mounted on the command transmitter building above Room 103.

3. One 26-1/2 -ft. diameter rigid radome above Room 103
(Universal Moulded Products Type).

Civil. Not applicable. See Fig. 8-1 for the location of the antenna.

Architectural. The architectural features of the building are satisfactory for the MUSAP-Phase B-2 installation.

Structural. The VHF command antenna will be mounted on the existing antenna support ring with an adapter base to align the centerline of the antenna with the centerline of the radome. The antenna criteria are as follows:

Approximate weight	2500 lbs.
Mounting bolt circle	43-1/2 in.
No. of mounting bolts	8, equally spaced.
Size and projection of mounting bolts	1" dia. - 4" proj.
Maximum wind loading	125 knots.
Height to centerline from base of antenna.	89 inches.

Radome. The radome criteria are as follows:

Type	Rigid.
Size	26-1/2 in. dia.
Bolt circle.	19 ft. - 10 ft. (existing)
No. & size of mounting bolts	54-1/2 in. dia. (existing)
Length of projection and thread.	1-1/2 in. (existing)
Height to centerline of radome from base	104.312.
Wind loading	125 knots/hr.
Weight of radome	2800 lbs.

An adapter ring will be required to bring the radome centerline up to the centerline of the antenna.

Mechanical. The total heat load generated by the electronic equipment is approximately 48,000 BTU/hr. The existing air conditioning system is adequate for the new equipment. All racks will exhaust into the room and heated air will be removed by the overhead ducts.

Electrical. The new electronic equipment will require approximately 14 kw of 120/208, 3Ø, 4 wire power. The existing power is adequate.

8.2 A&E DESIGN CRITERIA, THULE TRACKING STATION (TTS)

8.2.1 Introduction

The purpose of this section is to provide Architectural and Engineering (A&E) facility design criteria for MUSAP Phase B-2 at TTS. The scope of this section will cover the existing transmitting and receiving areas for TTS.

Location. TTS is located at Thule, Greenland. A site layout is shown in Fig. 8-5.

8.2.2 Existing A&E Criteria

The existing A&E criteria for TTS may be used as reference:

- A&E Design Criteria, Multiple Satellite Augmentation, Ground Station at the Thule Tracking Station., Rev. 22, June 1962.

8.2.3 New A&E Criteria for TTS

Summary. The MUSAP Phase B-2 program at TTS will include the installation of the following equipment in Building S-1824. A site plan is shown in Fig. 8-6. The existing Verlorb boresight tower No. 2 will be used to support the boresight equipment for the 375-mc portion of the quad-helix antenna subsystem.

8-6

1. Room 108. Ten new racks plus one relocated rack from the instrumentation van.
2. Room 113. Four racks of equipment.
3. Verlort Antenna Support Structure. A VHF command antenna will be mounted on the antenna support structure after the Verlort antenna is removed.

Civil. No changes are required.

Architectural. See Fig. 8-7 for room and antenna support structure layout. There are no new architectural features required.

Structural

1. The VHF command antenna will be installed on the antenna support structure when the Verlort antenna is removed. See Para. 8.1.4 for antenna mounting criteria. The centerlines of the antenna and the radome must coincide. This will require readjusting the relative height of the antenna base. Removal of a portion of the concrete antenna base will be required. New anchors should be installed per Para. 8.1.4; refer to Corps of Engineers Drawing No. AW 84-05-11, Sheet 3, File No. 8008-3673.
2. The existing 26-1/2 -ft. diameter rigid radome will be used to protect the 150-mc antenna (VHF command antenna).

Mechanical. The electronic equipment will generate the following heat load to the building:

- | | |
|------------------------------|----------------|
| 1. <u>Room 108</u> | 68,800 BTU/hr. |
| 2. <u>Room 113</u> | 47,800 BTU/hr. |

The heat generated in Room 113 will probably not be sufficient to heat the room to proper working temperatures. Therefore, other sources of heat must be supplied to the room in addition to the existing electrical heater. It is recommended that steam heat be supplied to reduce surges on the technical power load.

1. Room 108. The eleven racks of equipment will require 20.2 kw of 120/208, 3Ø, wire power. TTP 14 has 4.5 kw of connected load for Phase A. Power on this panel will be near capacity.
2. Room 113. The four racks plus the amplidyne will require 14 kw of 120/208, 3Ø, 4 wire power. The existing TPP-09 is a 100 amp. frame with a 70 amp, 3 pole, 4 wire, 120/208 capacity. This panel will be modified to contain 12 - 20 amp., 2 - 30 amp. and 2 - 40 plus 6 spare breakers.

8.3 INSTALLATION ENGINEERING, FORT GREELY TRACKING STATION (FGS)

The following drawings cover the location of equipment required for the implementation for MUSAP Phase B at FGS. The equipment has been chosen to permit maximum utilization of existing support facilities, expediency of implementation and impact of future program requirements.

8.3.1 DAP AREA

Room layouts for the DAP building locating new equipment for Phase B-2 and interfaced equipment for Phase A and the Program 461, are shown on the following drawings:

1. Figure 8-8 shows the equipment arrangement in Room 135 of the existing Program 461 equipment and Phase A MUSAP equipment. No Phase B-2 additions are planned for this room.

2. Figure 8-9 shows the equipment arrangement for Room 133. The equipment that was installed under Phase A consists of the station program board (JD-142) and the control and display console (OA-276) which will be modified to provide VHF command capabilities.
3. Figure 8-10 shows the equipment layout for Room 136. Present known program requirements do not include utilization of existing Program 461 data handling equipment. Phase A data handling equipment will be used, but requires an additional rack of command logic equipment (OA-281) to provide VHF command capability and modification of the telemetry data processor (OA-275) to handle GP-1 requirements.

8.3.2 Receiving Area

Equipment arrangement for the T&D Building No. 2 and the associated 60-ft. antenna will be as follows.

Figure 8-3 shows the equipment arrangement (for the existing Program 461 equipment) to be activated and relocated and the addition of the 400-mc command and autotrack equipment for Phase B-2, within T&D Building No. 2. In order to permit an optimum operational configuration and to allow for increased equipment capability, it is necessary to remove the new existing partition between rooms 102 and 106, and to provide a new cable trench in Room 102. Relocating the tracking and data console (OA-31) and its associated time display unit (ID-066) to Room 102 provides the operator with a clear and unobstructed field of vision and provides room for the eight additional racks of 400-mc command and autotrack equipment and one rack of data equipment. This arrangement is desirable from an operational and maintenance viewpoint, as well as for the economical use of new cabling.

The existing Program 461 60-ft. parabolic antenna will be activated and modified to provide and support the Phase B-2 requirements.

8.3.3 Command Transmitter Area

Room layouts locating new equipment for Phase B-2 and interfaced equipment for Phase A are shown, as follows.

Figure 8-4 shows the equipment arrangements for the four racks of VHF command equipment that will be located in Room 103 in the west end of the C/T building. This area was selected since adequate space and electrical power are available as well as a support structure which will accomodate the proposed two axis pedestal and antenna and a 26-1/2 -ft. diameter rigid radome (Universal Molded Products Type).

Figure 8-11 shows the location of the existing Prelort motor-generator installed under Phase A, as well as the two amplidynes required for the VHF command antenna for Phase B-2.

Figure 8-12 shows the location of the radar equipment installed under MUSAP Phase A. Timing for the VHF command equipment in Room 103 will be obtained from the time display distributor installed in OA-274 in Room 111.

8.4 INSTALLATION ENGINEERING, THULE TRACKING STATION (TTS)

The below referenced drawings depict the implementation of Phase B-2 equipment. The equipment locations and arrangements have been chosen to consider harmonious operation and expedient implementation.

8.4.1 Operations Building

The operations building room arrangements involved in Phase B-2 are shown on the following drawings:

1. Figure 8-13 shows the Phase A station operator's console (SOC). The SOC will be modified to accommodate the VHF command capability panel.

2. Figure 8-14 shows Phase A data subsystem equipment and the station program board and associated cable termination cabinets. The command logic equipment (OA-281) will be modified to accommodate the VHF command capability. The telemetry data processor (OA-275) will be modified to accept the 256 BPS telemetry signal.
3. Figure 8-15 shows Phase A and Phase B-2 FM/FM ground station, data subsystem, disc-on-rod (200-mc tracker) and quad-helix control equipment and the 400-mc command and Doppler system. Equipment that has been relocated from the instrumentation van is indicated by double cross-hatch.
4. Figure 8-16 shows Phase B-2 VHF antenna control and VHF command equipment. The existing Verlort antenna support structure will be used for the VHF command antenna. This dictates that the antenna control and VHF command equipment be located in Room 113. This location represents the shortest possible cable distance between the antenna control and the antenna pedestal.
5. Figure 8-17 shows the location of the Phase B-2 VHF yagi antenna, pedestal, and amplidyne units. The amplidyne unit will be located at the foot of the radar antenna support structure No. 2. An environmental enclosure will be supplied for the amplidyne units since the base of this structure is not heated.

8.4.2 Equipment to be Removed

The following equipment and vans to be removed and stored are indicated below.

1. Verlort radar van and all contents; antenna, pedestal and all external equipment including three-phase delta power transformers, and associated cabling; leave radome and heating intact.

2. Verlor boresight board coaxial and control cables going to the boresight tower should be stubbed off for future use.
3. Milgo data van; remove van, all associated cables and contents.
4. Administration and control van; remove van, all contents and associated cables.
5. Telemetry van; remove van, all contents and associated cables.
6. Instrumentation van; remove van, all contents except Cabinet OA-184 and a communications control panel from Cabinet OA-185 (amplifier, public address).
7. Junction boxes and cables not required by MUSAP.
8. 400-mc helix will be installed, the 400-mc parametric pre-amplifier, preamp mixer and diplexers and filters will be installed in the quad-helix antenna support structure.

8.5 SCHEDULES

The required site facilities efforts will include, but not be limited to, the following documentation which is also referenced in Figs. 3-1 and 3-2 of the activation schedules.

<u>Documentation</u>	<u>Completion Dates (From Start of Contract)</u>
Installation Drawings (Including Facility Design)	20 Weeks
Wire List Documentation	16 Weeks
Station Cross Connect Documentation	18 Weeks
Corp. of Engineer Facilities Requirement	24 Weeks

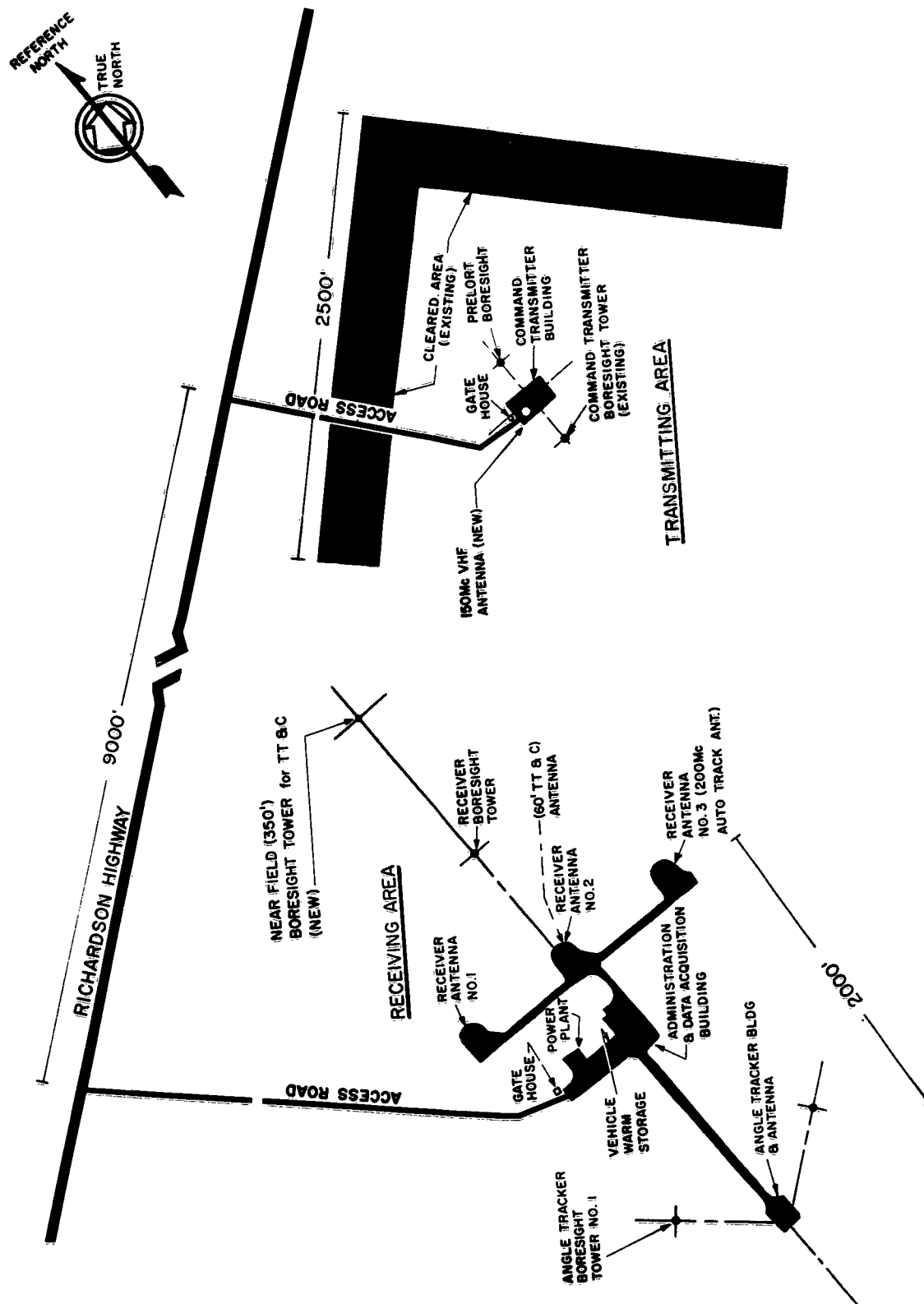
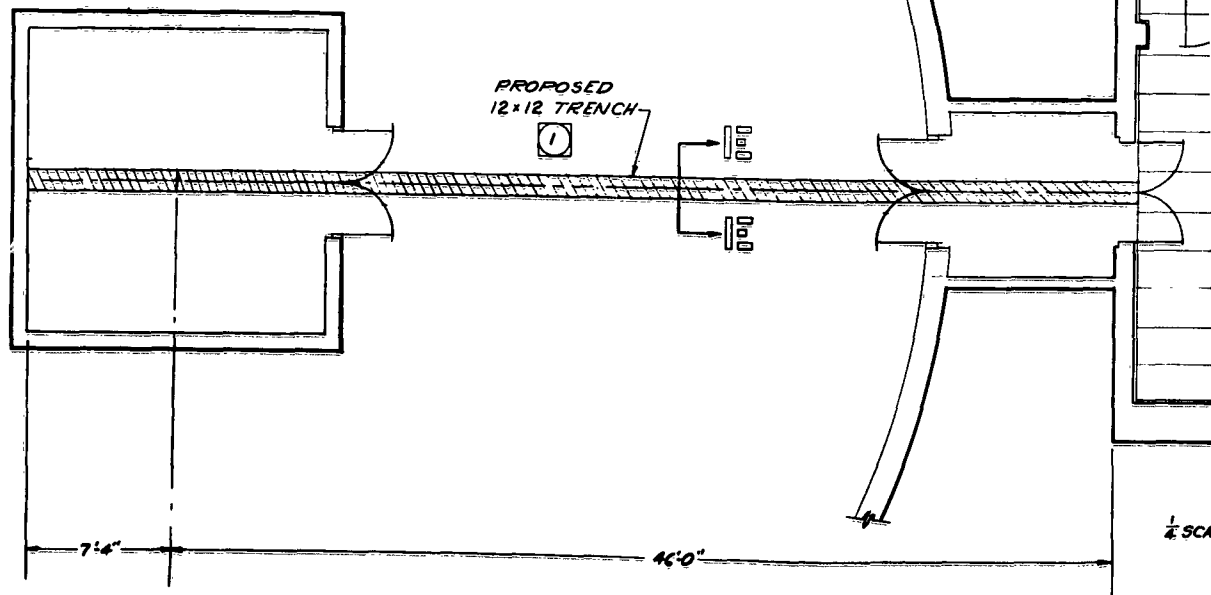
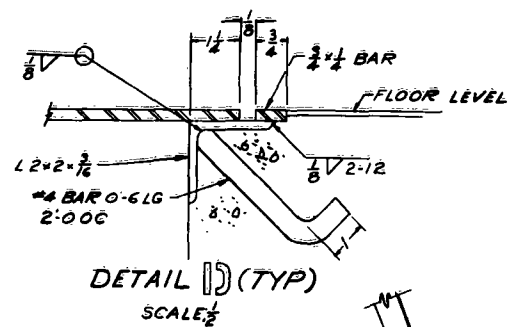
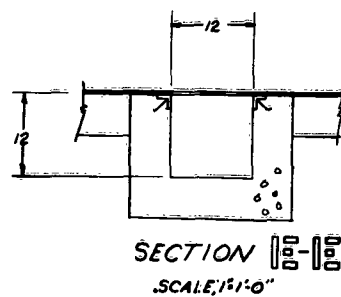
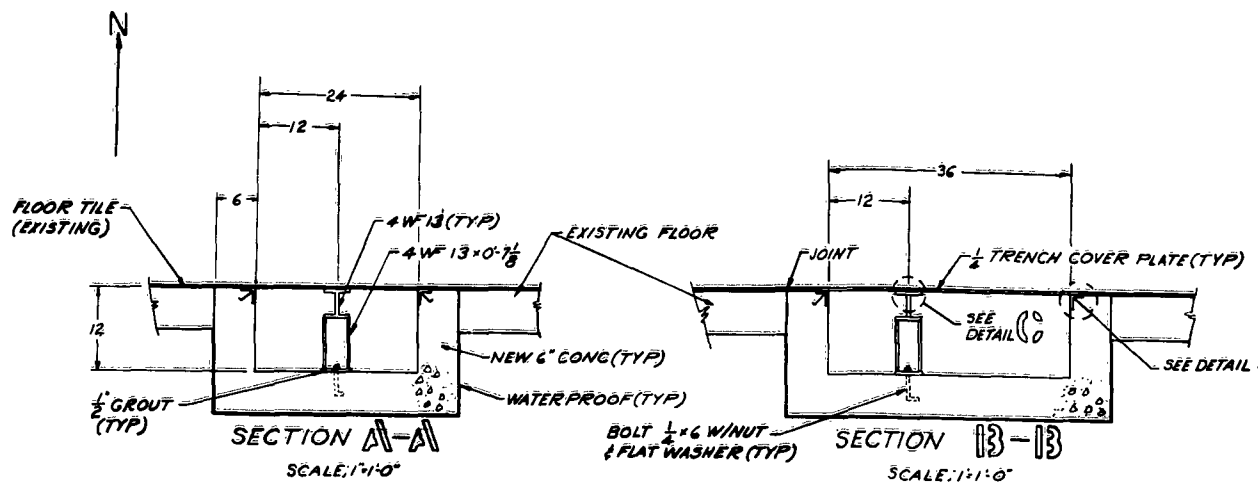


Fig. 8-1 FGS Site Layout



NOTES (UNLESS OTHERWISE SPECIFIED):

- ① INSTALLATION CONTRACTOR TO VERIFY LOCATION OF EXISTING DUCTS PRIOR TO EXCAVATION.

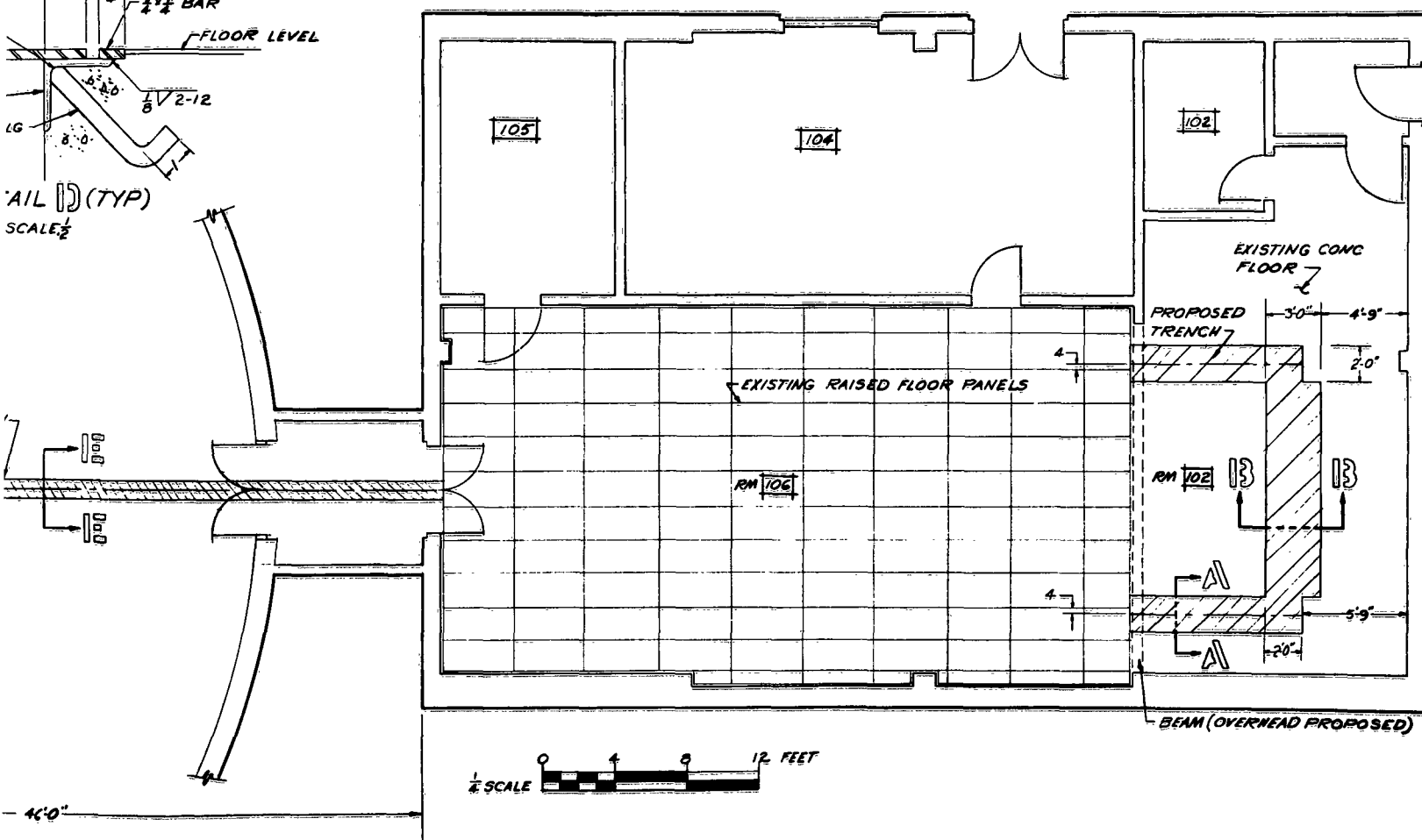
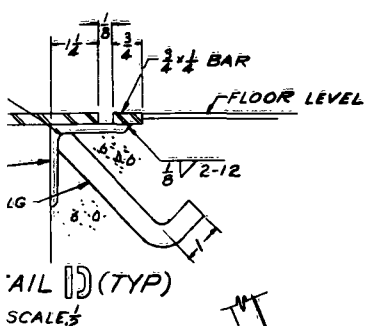
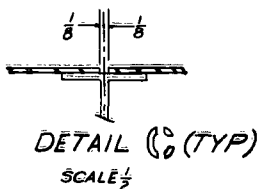
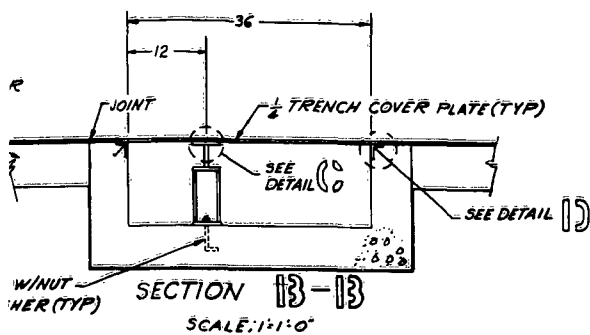
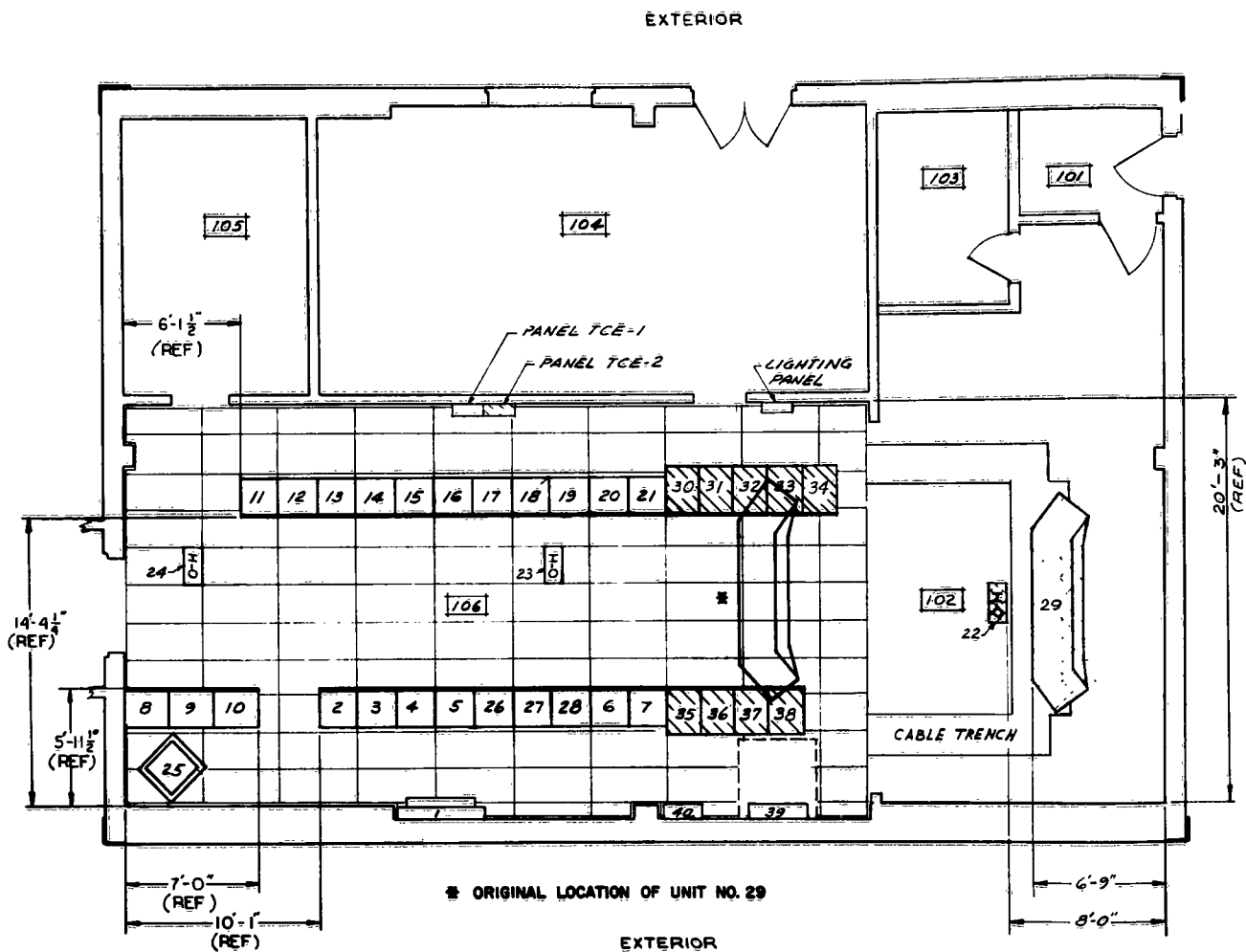


Fig. 8-2 Floor Plan, UHF T/D Building No. 2 (FGS)



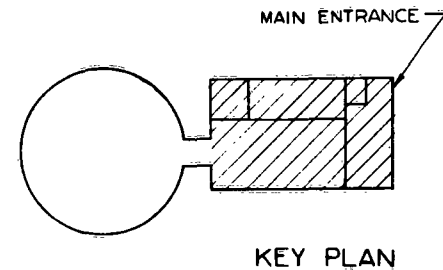
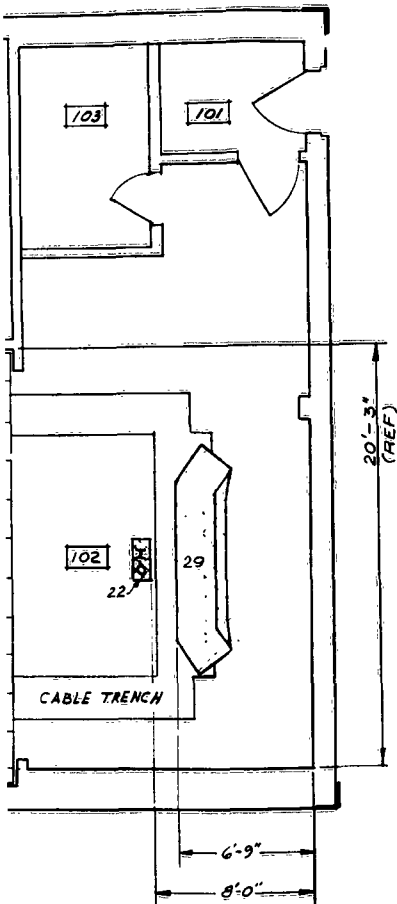
LEGEND	
	EQUIP. MTD ON DOLLY
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	RELOCATED EQUIPMENT
	OVERHEAD MTD EQUIP.

2. WALL BETWEEN ROOMS REMOVED AND CABLE 7 ADDED PER DWG 97-14

1. HEAVY LINE DENOTES FROM NOTES (UNLESS OTHER

2

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
1	RF FILTERING & SWITCHING GROUP	OA-76		461
2	RECEIVER, RADIO TRACKING #1	OA-33	24" x 24" x 83 1/2"	
3	RECEIVER, RADIO TELEMETRY #1	OA-32		
4	RECEIVER, RADIO TRACKING #2	OA-33		
5	RECEIVER, RADIO TELEMETRY #2	OA-32		
6	RECEIVER, TELEMETRIC DATA, VHF	OA-41		
7	RECORDER, VISUAL	OA-40	24" x 24" x 83 1/2"	
8	COMMUNICATION EQUIP RACK #1	WECO	28" x 26 1/2" x 84 1/2"	
9	COMMUNICATION EQUIP RACK #2	WECO	28" x 26 1/2" x 84 1/2"	
10	COMMUNICATION EQUIP RACK #3	WECO	28" x 26 1/2" x 84 1/2"	
11	ANTENNA SLAVE DATA GROUP	OA-43	24" x 24" x 83 1/2"	
12	CONTROL, ANTENNA SLAVE DATA	OA-42		
13	TIMING & DATA DISTRIBUTION, REMOTE	OA-44		
14	DRIVER, REMOTE TIME DISPLAY	OA-84		
15	MASTER CONTROL, REMOTE	OA-53		
16	NEARFIELD, BORESIGHT	OA-54		
17	CABINET ASSY, DISTRIBUTION	OA-34		
18	CONVERTER GROUP, FREQUENCY	OA-57		
19	CABINET ASSY, POWER SUPPLY	OA-24		
20	CABINET ASSY, POWER SERVO	OA-25		
21	CABINET ASSY, INTERMEDIATE SERVO	OA-23	24" x 24" x 83 1/2"	
22	REMOTE TIME DISPLAY (RTD #1)	ID-066	26 1/2" x 10 3/4" x 21"	
23	REMOTE TIME DISPLAY (RTD #2)	ID-066	26 1/2" x 10 3/4" x 21"	
24	REMOTE TIME DISPLAY (RTD #3)	ID-066	26 1/2" x 10 3/4" x 21"	
25	TEST SET, CHECKOUT & CALIBRATION (MOBILE)	OA-36	24" x 24" x 87 1/2"	
26	TEST SET, CHECKOUT & CALIBRATION	OA-37	24" x 24" x 83 1/2"	
27	TEST SET, CHECKOUT & CALIBRATION	OA-38	24" x 24" x 83 1/2"	
28	TEST SET, CHECKOUT & CALIBRATION	OA-39	24" x 24" x 83 1/2"	
29	TRACKING & DATA CONSOLE	OA-31	114" x 36"	461
30	TEST, CHECKOUT & CALIBRATION	U/A	21" x 30 3/4" x 82 1/2"	MSA-B2
31	400 MC FREQUENCY CONTROL	U/A		
32	RECEIVER #1-400 MC DOPPLER	U/A		
33	RECEIVER #2-400 MC DOPPLER	U/A		
34	MONITOR-400 MC DOPPLER RECEIVER	U/A		
35	REMOTE DIGITAL TERMINAL	U/A		
36	MONITOR, EXCITER	U/A		
37	15W TRANSMITTER EXCITER	U/A		
38	DIPLEXER & RF FILTER ASSY	U/A	21" x 30 3/4" x 82 1/2"	MSA-B2
39	INSTRUMENTATION TERMINAL CABINET	JD-90	36" x 8" x 48"	461
40	JUNCTION BOX, RTD	JD-92	24" x 8" x 42"	461

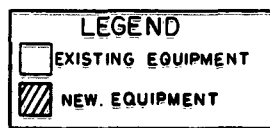
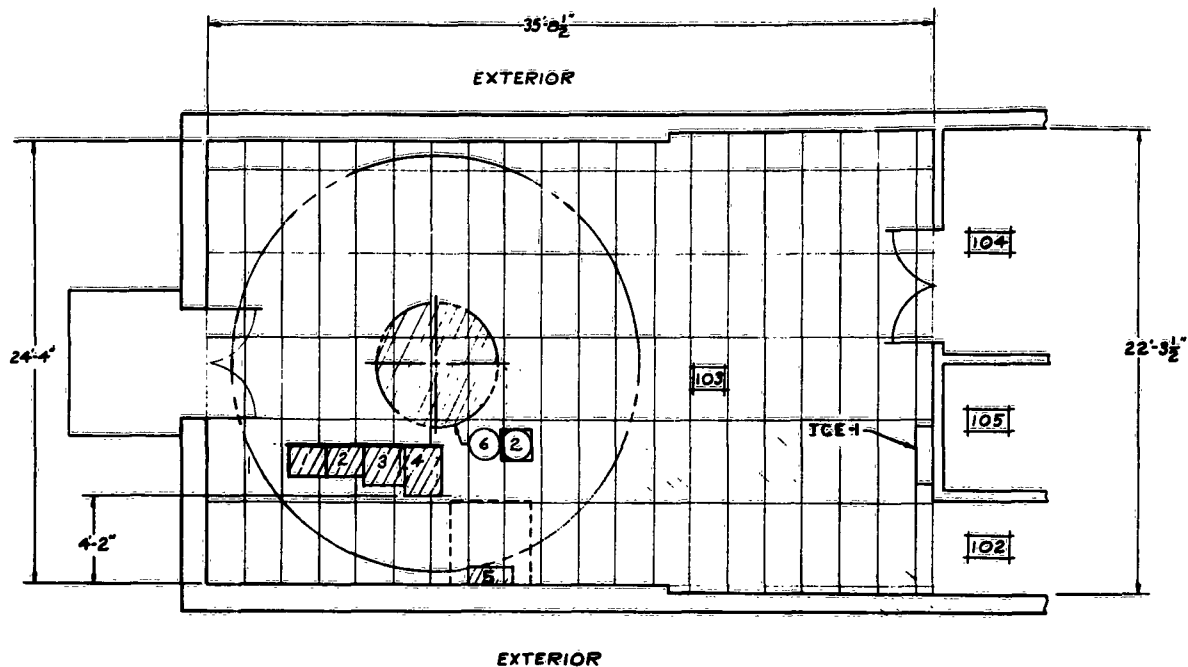
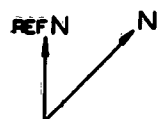


2. WALL BETWEEN ROOMS 102 AND 106 TO BE REMOVED AND CABLE TRENCH IN ROOM 102 ADDED PER DWG 97-144640.

1. HEAVY LINE DENOTES FRONT OF EQUIPMENT.

NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-3 60-Ft. TT&C Equipment Layout, T/D Building No. 2 (FGS)



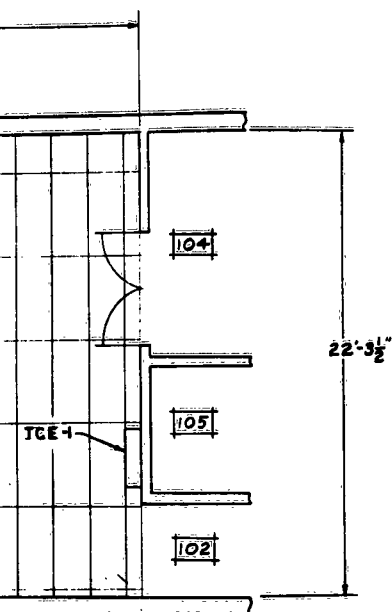
② ITEM 6 MOUNTED ON ROOM SUPPORT RING.

1 HEAVY LINE DENOTES FRONT NOTES (UNLESS OTHER)

Fig. 8.

2

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE W X D X H	PROGRAM
1	1 KW TRANSMITTER NO.1	U / A	22x18x67 1/2	MSAP 82
2	1 KW TRANSMITTER NO.2	U / A	22x18x67 1/2	
3	ANTENNA CONTROL	U / A	24x24x85	
4	COM/ECHO CHECK DET & TONE GEN	U / A	21x30x82 1/2	
5	CABLE TERMINATION CABINET	JD - 144	36x10x48	
6	ANTENNA ASSY, VHF COMMAND	U / A		MSAP 82



2 ITEM 6 MOUNTED ON ROOF TO ANTENNA SUPPORT RING.

1 HEAVY LINE DENOTES FRONT OF EQUIPMENT.

NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-4 VHF Command Equipment Layout, Room 103, C/T Building (FGS)

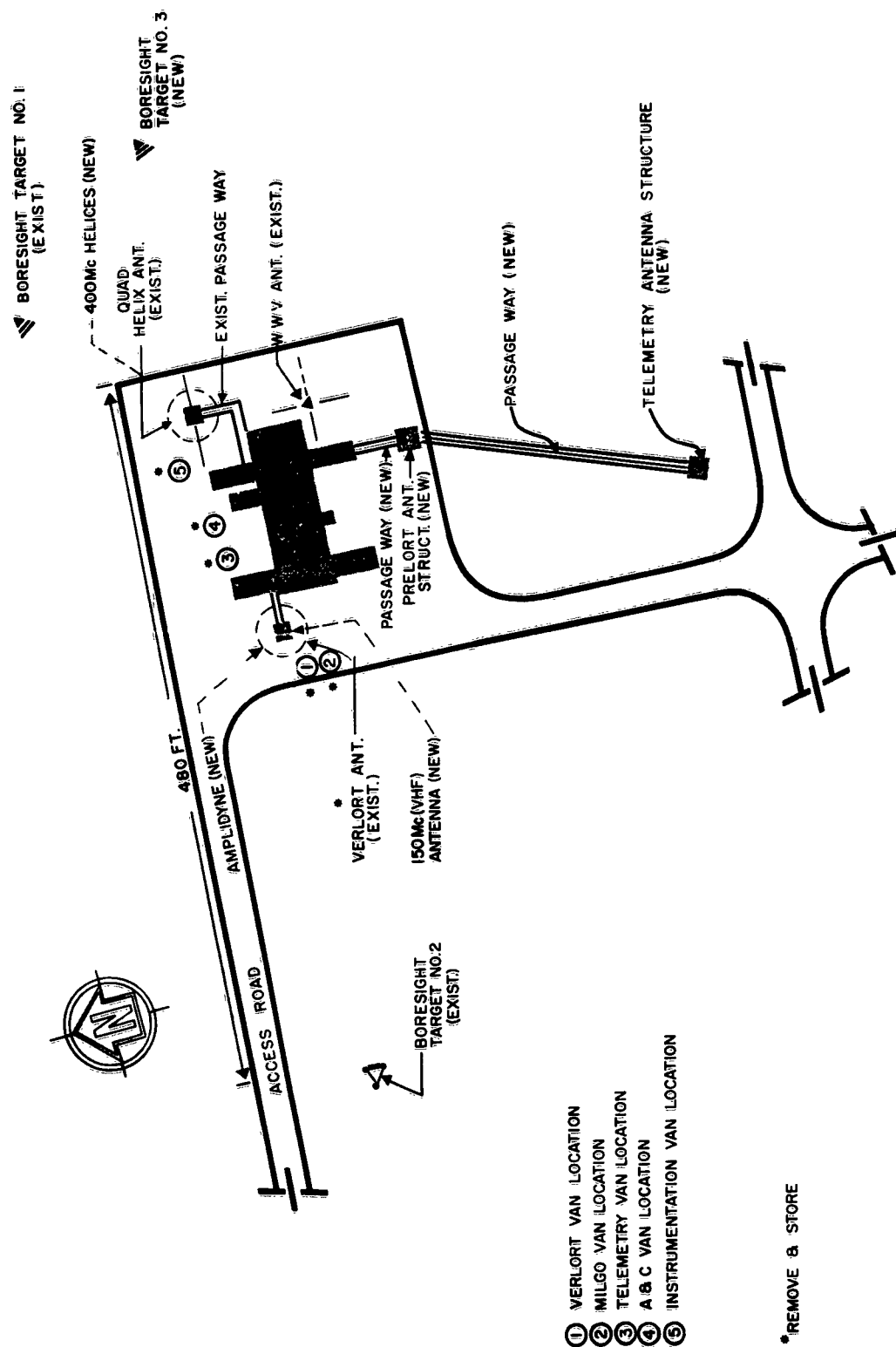
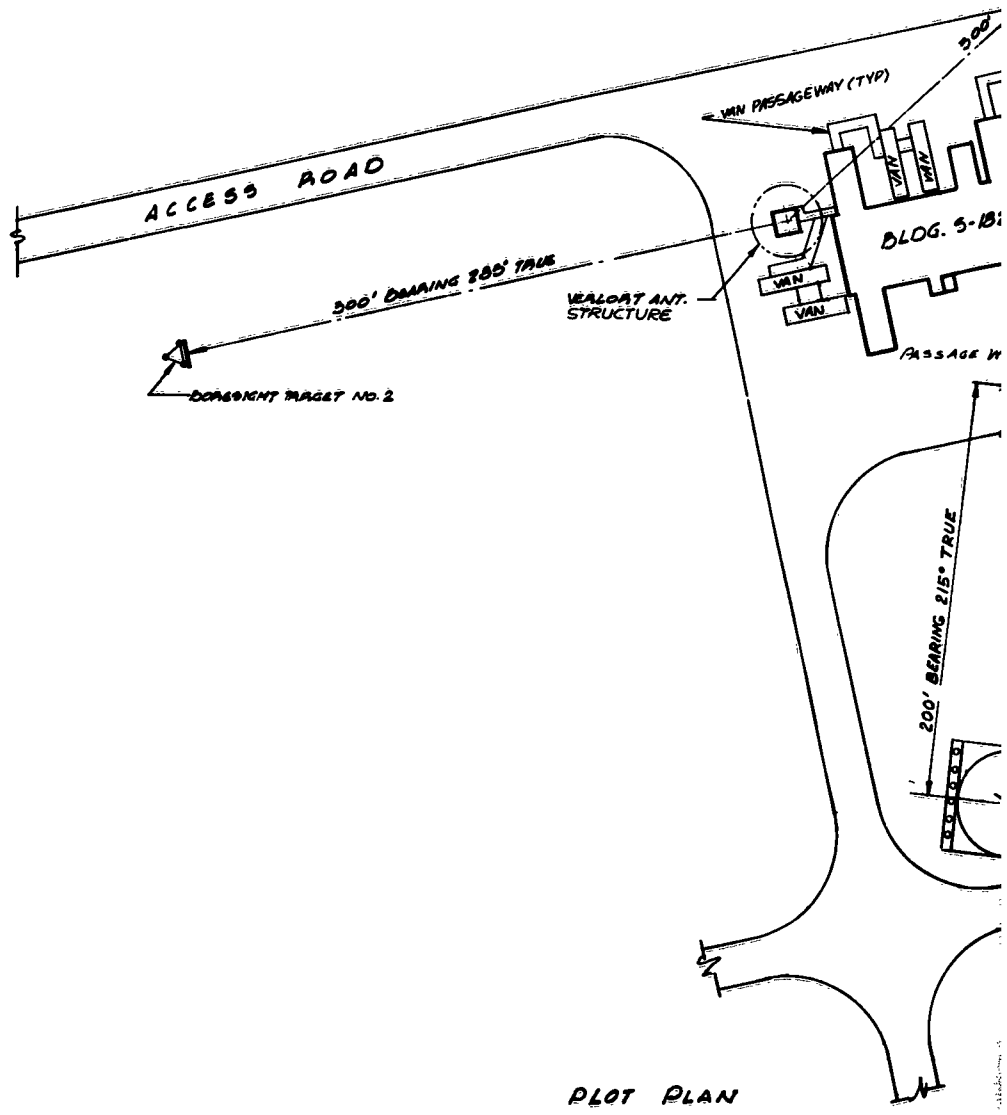


Fig. 8-5 TTS Site Layout



PLOT PLAN
SCALE: 1"=40'



Fig. 8-6 Plot Plan, TTS 8-18

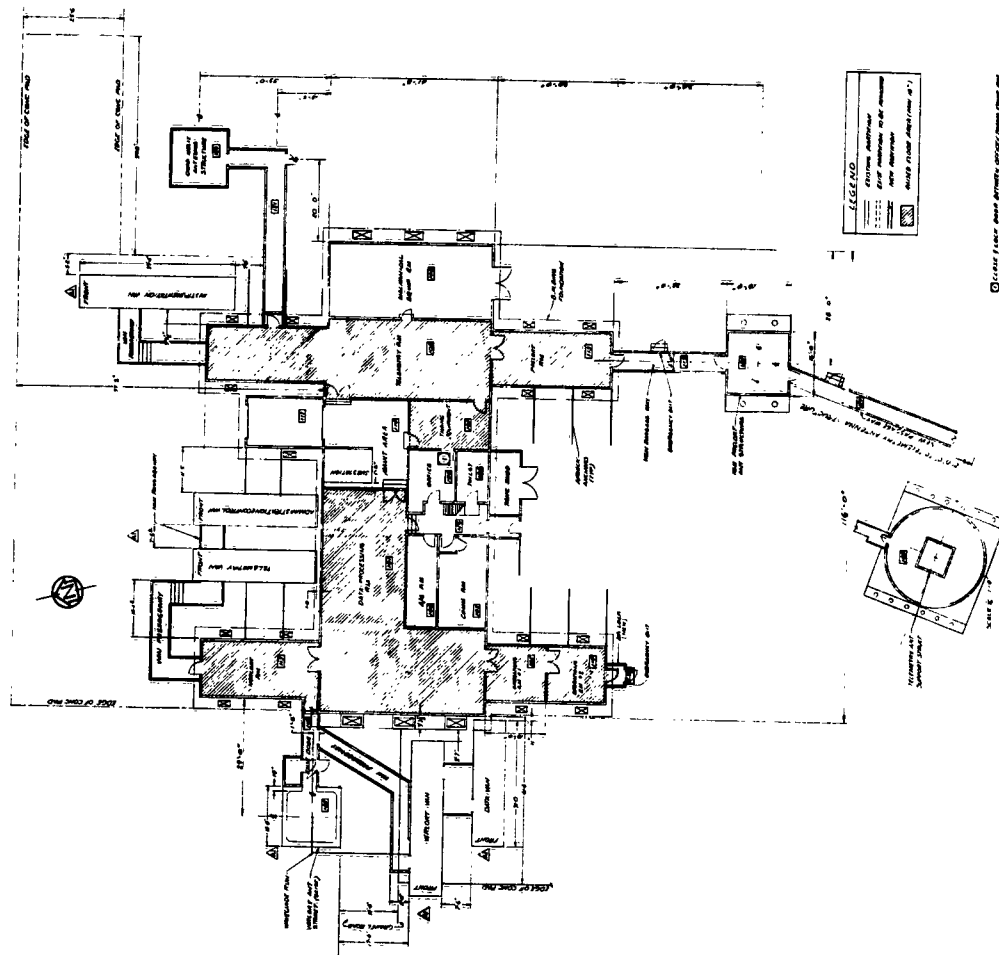
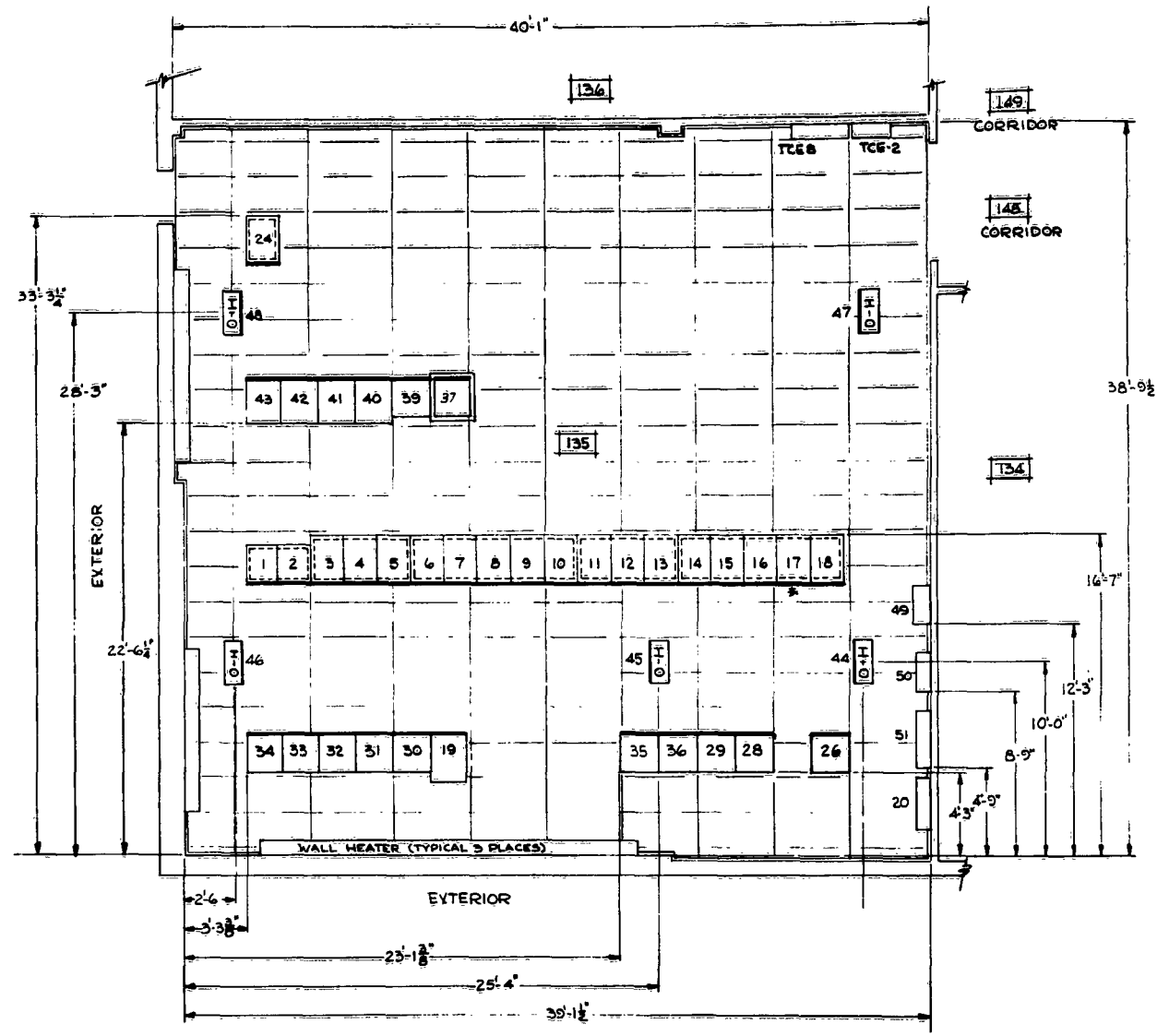


Fig. 8-7 Floor Plan, Building S-1824, Multi-Satellite Augmentation, TTS

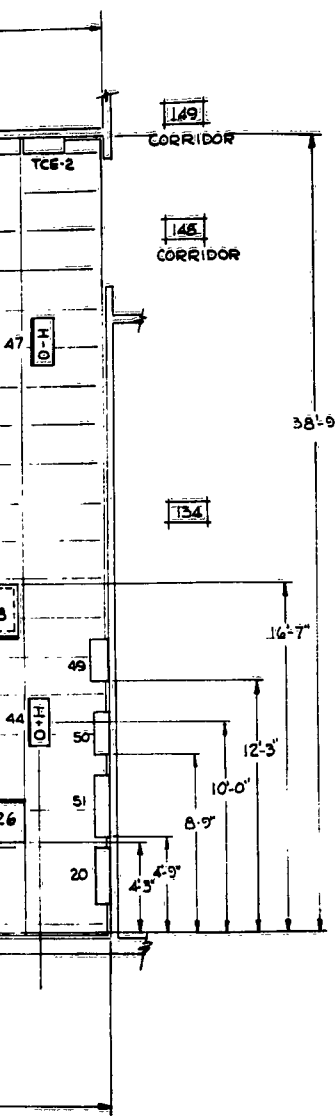


LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	FUTURE EQUIPMENT
	OVERHEAD MOUNTED EQUIPMENT
	PALLETIZED EQUIPMENT

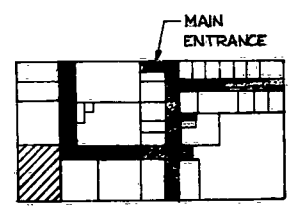
* ② UNIT 17 TO BE MODIFIED TO PROVIDE VERIFICATION DETECTOR & INDICATOR

1. HEAVY LINE DENOTES FRONT OF EQUIPMENT (UNLESS OTHERWISE NOTED)

2



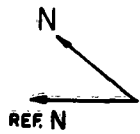
UNIT NO	DESCRIPTION	MODEL NO	SIZE (WxDxH)	PROGRAM
1	TLM TAPE RECORDER NO.1	OA-234	24" x 24" x 73"	MSAP-A
2	TAPE RECORDER NO.2	-235	24" x 24" x 73"	
3	RECEIVER & DEGAUSSER	-236A	21" x 30 1/2" x 82 1/2"	
4	RECEIVER & TEST	-237A		
5	RECEIVER & STORAGE	-238A		
6	RECORDER & MONITOR	-239		
7	DETECTOR & LINE DRIVER	-240A		
8	COMMUNICATION & PATCH	-241		
9	AMPLIFIER & LINE DRIVER	-242A		
10	RECORDER & CONTROL	-243		
11	ALIGNMENT & COMMUNICATION	-244A		
12	SUB-CARRIER DISCRIMINATOR	-245A		
13	ALIGNMENT & TEST	-246A		
14	DECOMMUTATOR & RECORDER	-247A		
15	ALIGNMENT & RECORDER	-248A		
16	DECOMMUTATOR & RECORDER	-249A		
17	EQUIP RACK (SPARE)	-268A		
18	TLM EQUIP RACK (SPARE)	OA-269A		
19	TIME DISPLAY GENERATOR	OA-285	21" x 30 1/2" x 82 1/2"	
20	CABLE TERMINATION CABINET	JD-144	36" x 10" x 48"	MSAP-A
21				
22				
23				
24	TELEMETRY & DECODING	OA-266	21" x 30 1/2" x 82 1/2"	MSAP-A
25				
26	DISPLAY DACON CONTROL	OA-49	24" x 24" x 83 1/2"	461
27				
28	TERMINATION & CONTROL GROUP	OA-56	24" x 24" x 83 1/2"	461
29	INSTRUMENTATION CONTROL GROUP	-59		
30	TIME CODE WORD ACCUMULATOR	-50		
31	GROUND TIMING SUPPORT	-46		
32	GROUND TIMING GENERATOR "A"	-48		
33	GROUND TIMING CONTROL	-47		
34	GROUND TIMING GENERATOR "B"	-86		
35	DIGITAL DATA TRANSCIVER GROUP	-45		
36	CHASSIS CARD TESTER	-51	24" x 24" x 83 1/2"	
37	CHECKOUT & CALIBRATION (MOBILE)	OA-35	24" x 24" x 87 1/2"	461
38				
39	DETECTION & DISTRIBUTION	OA-10	24" x 24" x 83 1/2"	461
40	SYNC SEPARATOR & SEQUENCER NO.1	-105	24" x 26" x 83 1/2"	
41	SYNC SEPARATOR & SEQUENCER NO.2	-106		
42	MONITOR & CONTROL POWER SUPPLY	-107		
43	RECORD/REPRODUCE DIGITIZER	OA-108	24" x 26" x 83 1/2"	
44	REMOTE TIME DISPLAY	ID-066-1	26 1/2" x 10 1/2" x 21"	
45		ID-066-2		
46		ID-066-3		
47		ID-066-4		
48	REMOTE TIME DISPLAY	ID-066-5	26 1/2" x 10 1/2" x 21"	
49	EQUIPMENT GROUND CABINET	U/A	24" x 10" x 36"	
50	RTD JUNCTION BOX	JD-92	24" x 8" x 42"	
51	INSTRUMENTATION TERMINAL CABINET	JD-90	36" x 8" x 60"	461



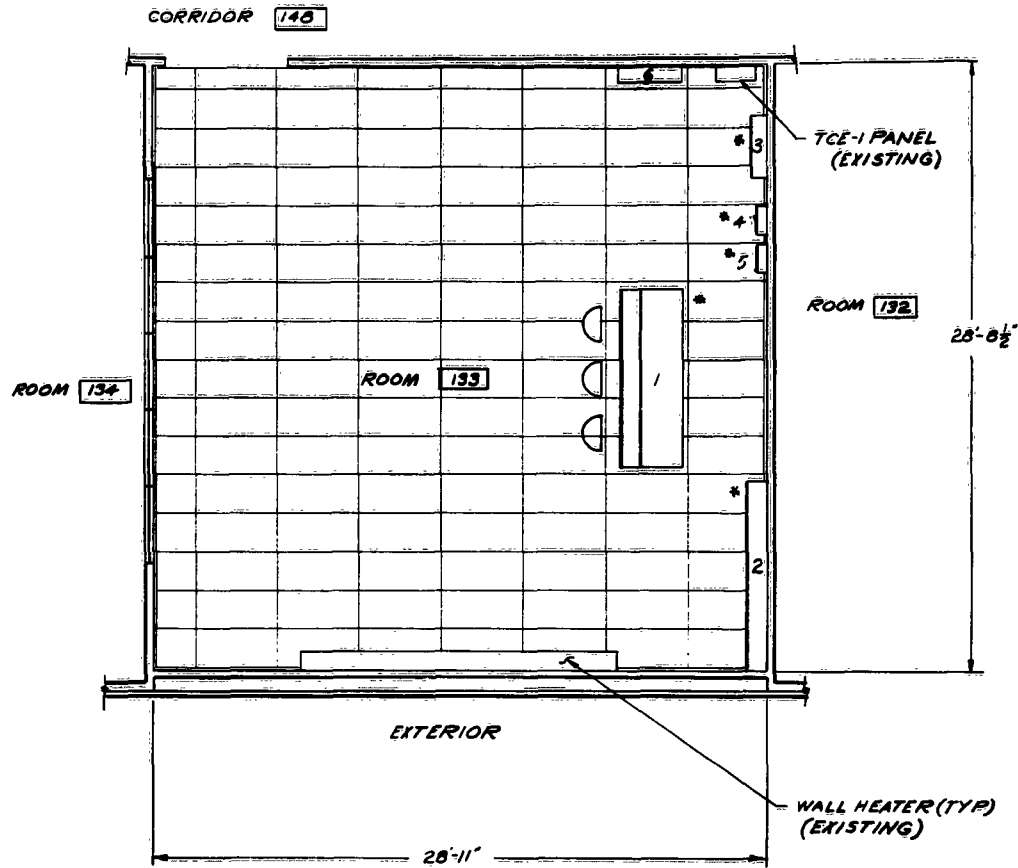
KEY PLAN



- ② UNIT 17 TO BE MODIFIED TO PROVIDE VHF COMMAND VERIFICATION DETECTOR & INDICATOR.
1. HEAVY LINE DENOTES FRONT OF EQUIPMENT
- NOTES (UNLESS OTHERWISE SPECIFIED):



UNIT NO.	DESC
1	CONTROL DIS
2	STATION PRO
3	CABLE TERMIN
4	SWITCH LINE
5	SWITCH LINE
6	CABLE TERMIN



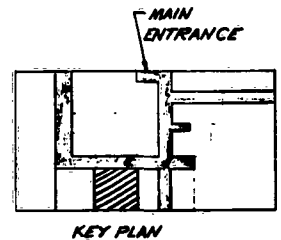
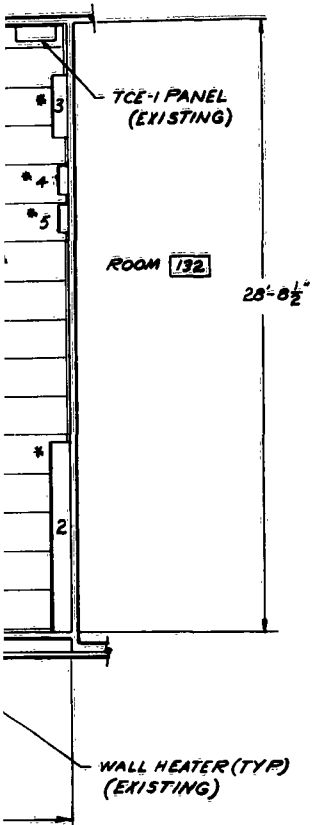
LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	RELOCATED EQUIP.
	FUTURE EQUIPMENT
	EQUIP. MTD. ON PALLET
	OVERHEAD MTG. EQUIP.

* ② UNITS 1, 2, 3, 4 & 5 TO BE MODIFIED TO PROVIDE V
COMMAND CAPABILITY.
1. HEAVY LINE DENOTES FRONT OF EQUIPMENT

NOTES (UNLESS OTHERWISE SPECIFIED)

2

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
1	CONTROL DISPLAY CONSOLE	CA-276	101 1/2 x 36 x 46	MSA
2	STATION PROGRAM BOARD	JD-142	108 x 15 x 72	
3	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	
4	SYNCHRO LINE BALANCING UNIT 1	JD-148	16 x 7 x 20	
5	SYNCHRO LINE BALANCING UNIT 2	JD-148	16 x 7 x 20	
6	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	MSA

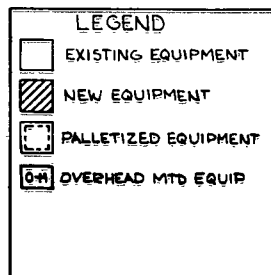
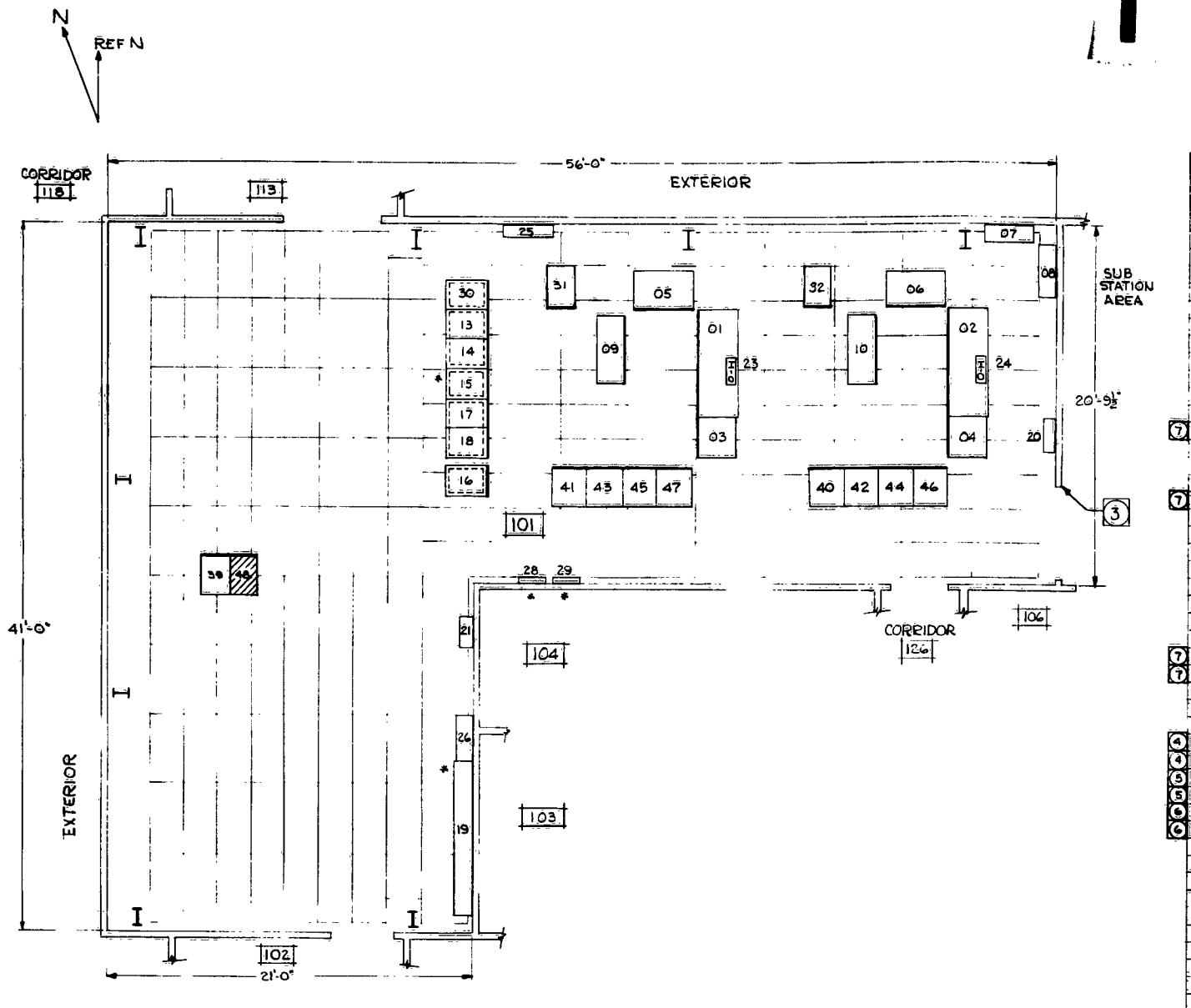


* ② UNITS 1, 2, 3, 4 & 5 TO BE MODIFIED TO PROVIDE VHF COMMAND CAPABILITY.

1. HEAVY LINE DENOTES FRONT OF EQUIPMENT.

NOTES (UNLESS OTHERWISE SPECIFIED):

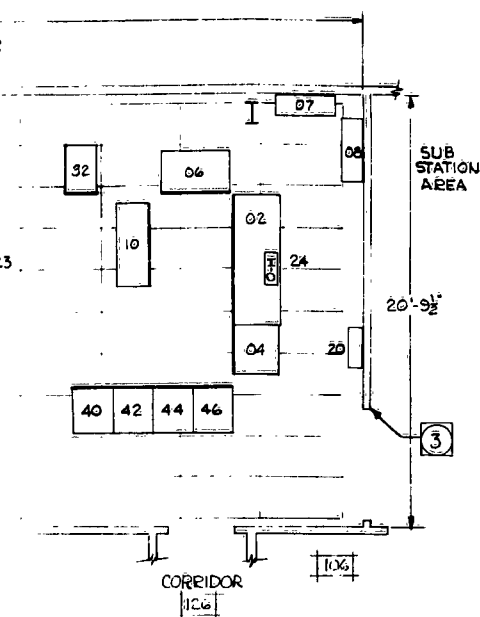
Fig. 8-9 Control and Display Equipment Layout, Room 135, DAP Building (FGS)



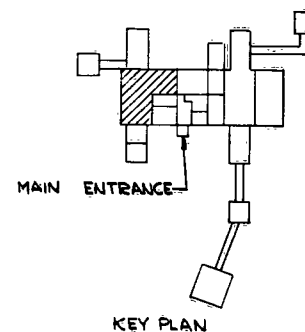
- * ⑦ MODIFY TO PROVIDE MSA-B2 VHF COMMA
 ⑥ UNITS 37 & 38 LOCATED IN UNITS 14 & 17, RE
 ⑤ UNITS 35 & 36 LOCATED ON TOP OF UNITS 41
 ④ UNITS 33 & 34 LOCATED ON UNITS 01 & 02, R
 3 WALL HEIGHT 7'-6"
 2. DARK LINES INDICATE FRONT OF EQU
 1. DIMENSIONS SHOWN ARE NOMINAL.
 NOTES (UNLESS OTHERWISE SPEC

Fig.

2



UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
01	COMPUTER	CDC-160A	61 x 30 1/2 x 56 1/2	MSA
02	COMPUTER	CDC-160A	61 x 30 1/2 x 56 1/2	
03	TYPEWRITER UNIT	CDC-161	28 1/2 x 30 x 57 1/2	
04	TYPEWRITER UNIT	CDC-161	28 1/2 x 30 x 57 1/2	
05	BUFFERED LINE PRINTER	CDC-166	41 x 29 x 48	
06	BUFFERED LINE PRINTER	CDC-166	41 x 29 x 48	MSA
07	COMM DISTRIBUTION CABINET	GDC	36 x 10 x 48	622
08	INSTR TERMINATION CABINET	ITC	48 x 10 x 60	622
09	AUXILIARY MEMORY UNIT	CDC-169	47 1/2 x 20 1/2 x 43	MSA
10	AUXILIARY MEMORY UNIT	CDC-169	47 1/2 x 20 1/2 x 43	
11				
12				
13	INPUT/OUTPUT BUFFER, LOGIC NO.1	OA-280	21 x 30 1/2 x 82 1/2	
14	INPUT/OUTPUT BUFFER, CONTROL	OA-279		
15	COMMAND LOGIC	OA-281		
16	COMPUTER COMM CONVERTER	OA-303		
17	TELEMETRY DATA PROCESSOR	OA-275		
18	CROSS CONNECT PANEL	OA-304	21 x 30 1/2 x 82 1/2	
19	STATION PROGRAM BOARD	JD-142	72 x 96 x 12	
20	TECH PWR DISTR PANEL BOARD	TPP-01		
21	TECH PWR DISTR PANEL BOARD	TPP-08		
22				
23	REMOTE TIME DISPLAY UNIT	ID-15B	19 x 8 x 5	
24	REMOTE TIME DISPLAY UNIT	ID-15B	19 x 8 x 5	
25	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	
26	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	
27				
28	SYNCHRO LINE BALANCING UNIT	JD-148	16 x 6 x 20	
29	SYNCHRO LINE BALANCING UNIT	JD-148	16 x 6 x 20	
30	INPUT/OUTPUT BUFFER, LOGIC #2	OA-295	21 x 30 1/2 x 82 1/2	
31	CONTROL UNIT, MAGNETIC TAPE SYSTEM	CDC-163A	30 x 18 x 29	
32	CONTROL UNIT, MAGNETIC TAPE SYSTEM	CDC-163A	30 x 18 x 29	
33	COMMUNICATION PANEL		19 x 12 x 7	
34	COMMUNICATION PANEL		19 x 12 x 7	
35	COMMUNICATION JACK BOX		5 x 9 x 5	
36	COMMUNICATION JACK BOX		5 x 9 x 5	
37	COMMUNICATION JACK BOX		5 x 9 x 5	
38	COMMUNICATION JACK BOX		5 x 9 x 5	
39	MODEM UNIT	OA-309A	21 x 30 1/2 x 82 1/2	
40	MAGNETIC TAPE TRANSPORT	CDC-163A	28 x 33 x 72	
41				
42				
43				
44				
45				
46				
47	MAGNETIC TAPE TRANSPORT	CDC-163A	28 x 33 x 72	MSA
48	COMMAND LOGIC EQUIP		21 x 30 x 82 1/2	MSA-B2

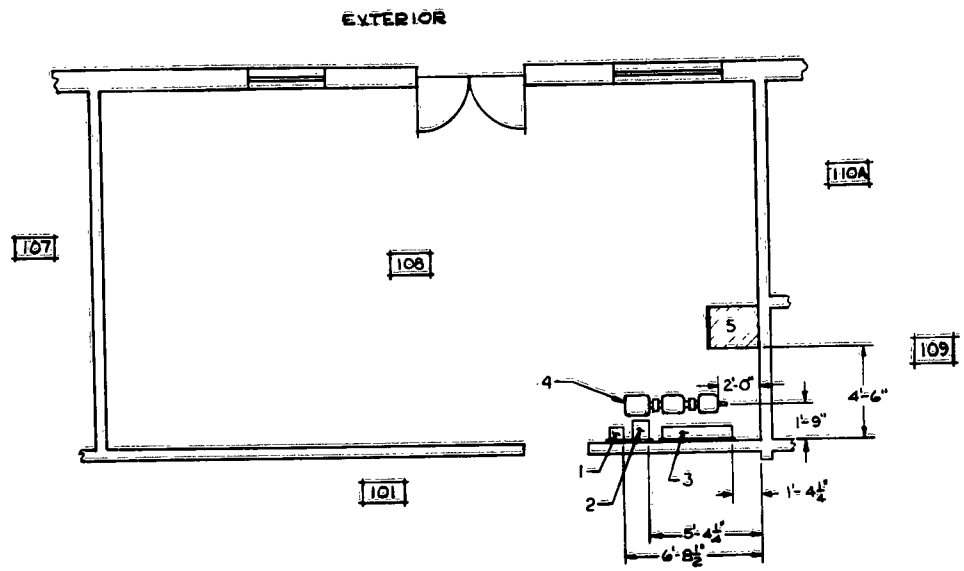


1" SCALE 0 4 8 12 FEET

- * ⑦ MODIFY TO PROVIDE MSA-B2 VHF COMMAND CAPABILITIES.
- ⑥ UNITS 37 & 39 LOCATED IN UNITS 14 & 17, RESPECTIVELY.
- ⑤ UNITS 35 & 36 LOCATED ON TOP OF UNITS 43 & 42, RESPECTIVELY.
- ④ UNITS 33 & 34 LOCATED ON UNITS 01 & 02, RESPECTIVELY.
- 3. WALL HEIGHT 7'-6"
- 2. DARK LINES INDICATE FRONT OF EQUIPMENT
- 1. DIMENSIONS SHOWN ARE NOMINAL.

NOTES (UNLESS OTHERWISE SPECIFIED)

Fig. 8-10 Data Processing Equipment Layout, Room 136, DAP Building (TTS)



UNIT NO.	DESCR
1	POWER SWITCH.
2	CONTROLLER, M.
3	CONTROL BOX
4	MOTOR GENEE
5	AMPLIDYNE R

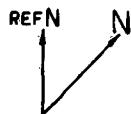
LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT

1. HEAVY LINE DENOTES FRONT OF EQUIPMENT.
NOTES (UNLESS OTHERWISE SPECIFIED)

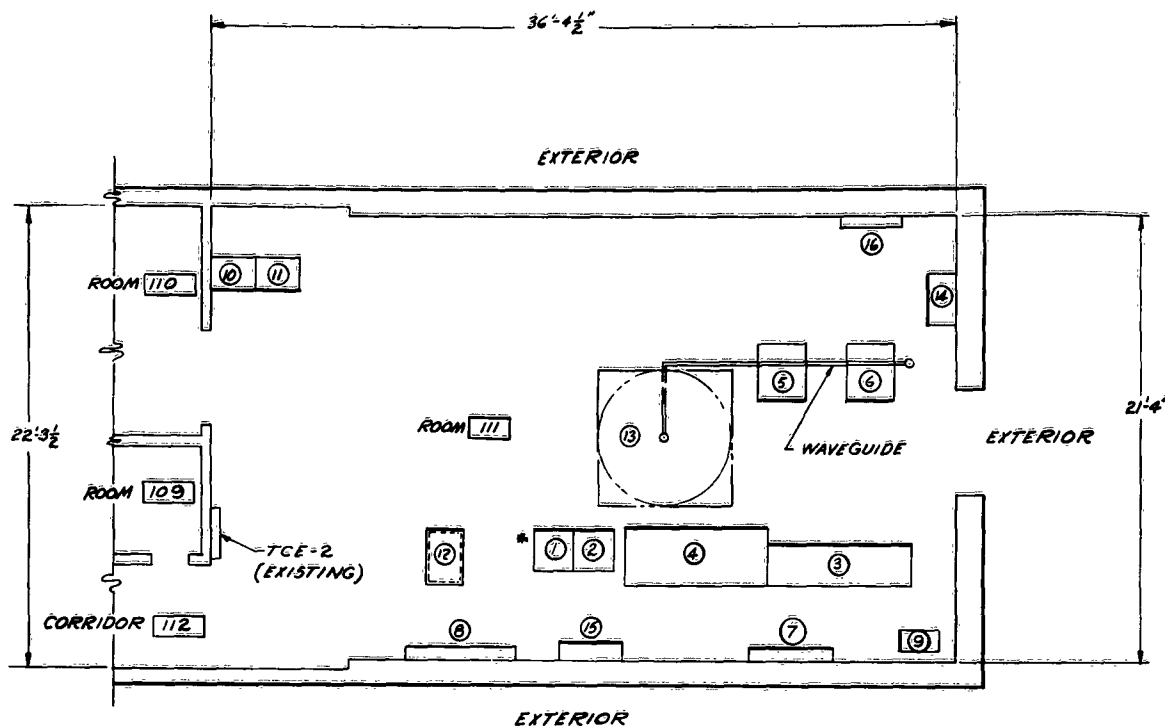
Fig. 8-11 Mo

4'-6"





1

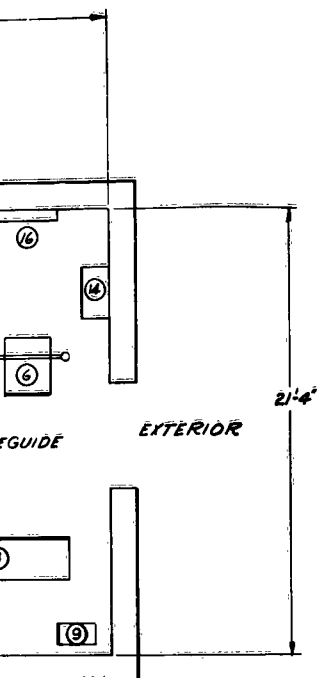


UNIT NO	DESCR
1	TIMING & CALIBR
2	POWER SERV
3	AUXILIARY CAB
4	RADAR CONTRL
5	HIGH VOLTAGE
6	TRANSMITTER
7	ENTRANCE SW
8	JUNCTION BO
9	VOLTAGE REGUL
10	COMMUNICATIO
11	COMMUNICATIO
12	REMOTE DIGIT
13	ANTENNA ASS
14	DEHYDRATOR
15	CABLE TERMIN
16	CABLE PRESSU

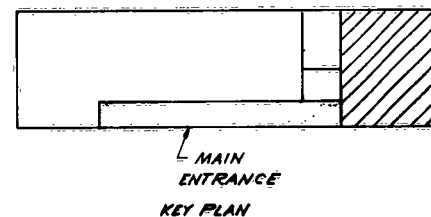
LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	RELOCATED EQUIP
	FUTURE EQUIPMENT
	EQUIP MTD. ON PALLET
	OVERHEAD MTD EQUIP.

* 2 UNIT 1 INTERFACES WITH EQUIP. IN RM 103
 DWG 144331 REQUIRED FOR PHASE B2
 1 HEAVY LINE DENOTES FRONT OF EQUIPMENT

NOTES (UNLESS OTHERWISE SPECIFIED):



UNIT NO	DESCRIPTION	MODEL NO.	SIZE (W×D×H)	PROGRAM
1	TIMING & CALIBRATION ASSY	OA-274	24×24×77	MSAP-A
2	POWER SERVO AMP ASSY	OA-302	24×24×77	
3	AUXILIARY CABINET	OA-301	85×24×77	
4	RADAR CONTROL CONSOLE	OA-278	85×36×81	
5	HIGH VOLTAGE RECTIFIER ASSY	OA-300	29×34×70	
6	TRANSMITTER RCVR & MOD ASSY	OA-299	29×34×70	
7	ENTRANCE SWITCH BOX	JD-151	40×8×80	
8	JUNCTION BOX	JD-152	64×9×80	
9	VOLTAGE REGULATOR & CONT ASSY	CN-43	11×24×33	
10	COMMUNICATION RACK #1 (WECO)	OA-307	26×17×83	
11	COMMUNICATION RACK #2 (WECO)	OA-308	26×17×83	
12	REMOTE DIGITAL TERM #1	OA-282	21×30×82	
13	ANTENNA ASSY	AS-18		
14	DEHYDRATOR	HD-43	30×18×23	
15	CABLE TERMINATION CABINET	JD-144	36×10×48	
16	CABLE PRESSURE SYSTEM PANEL	U/A	36×6×36	MSAP-A



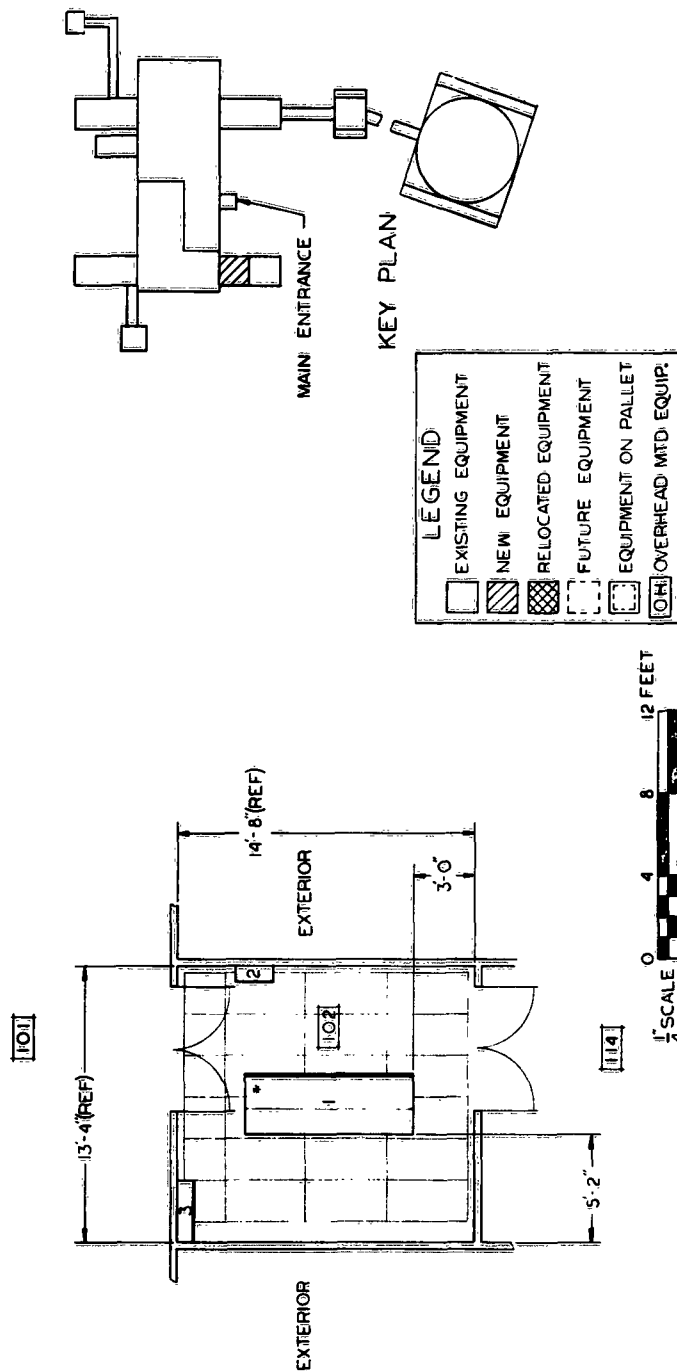
- * ② UNIT 1 INTERFACES WITH EQUIP. IN RM 103
 DWG 144331 REQUIRED FOR PHASE B2
 1. HEAVY LINE DENOTES FRONT OF EQUIPMENT

NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-12 Radar Equipment Layout, Room 111, C/T Building (FGS)

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
1	SYSTEM OPERATORS CONSOLE	DA-276	35 x 100 x 48	MSA
2	POWER PANEL	TPP-02		MSA
3	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	MSA

N

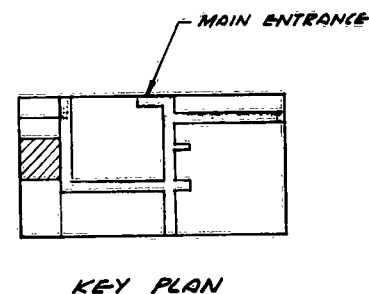
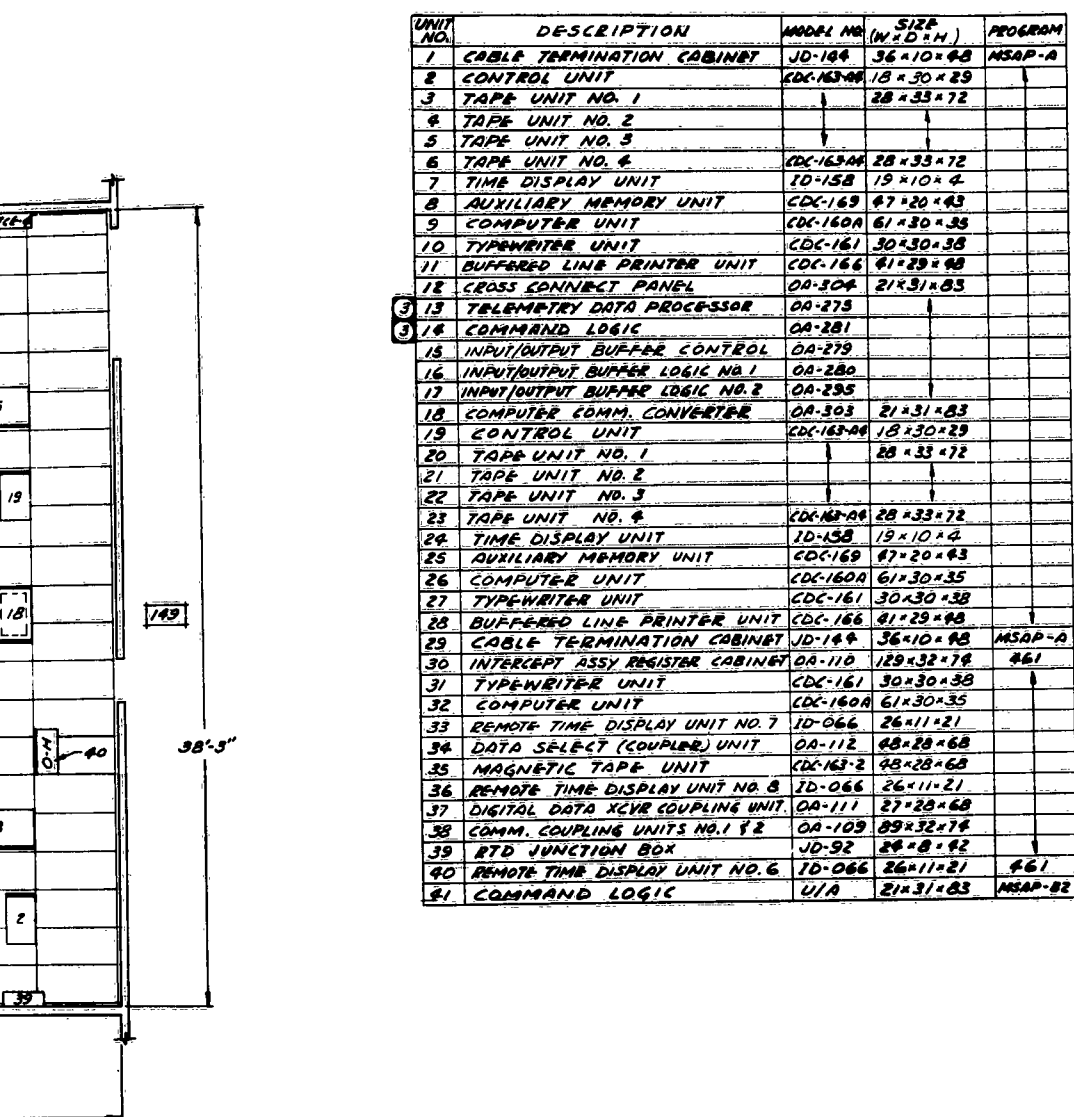


* 2 UNIT 1 WILL BE MODIFIED TO ACCOMMODATE
PHASE B-2 COMMAND CAPABILITIES

1 HEAVY LINE DENOTES FRONT OF EQUIPMENT
NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-13 Control and Display Equipment Layout, Room 102 (TTS)

2



UNITS 13 & 14 TO BE MODIFIED TO PROVIDE VME COMMAND CAPABILITY.

HEAVY LINE DENOTES FRONT OF EQUIPMENT.

ALIGN EDGE OF ALL EQUIPMENT RACKS & CABINETS 2 INCHES FROM EDGE OF REMOVABLE FLOOR PANELS AS SHOWN.

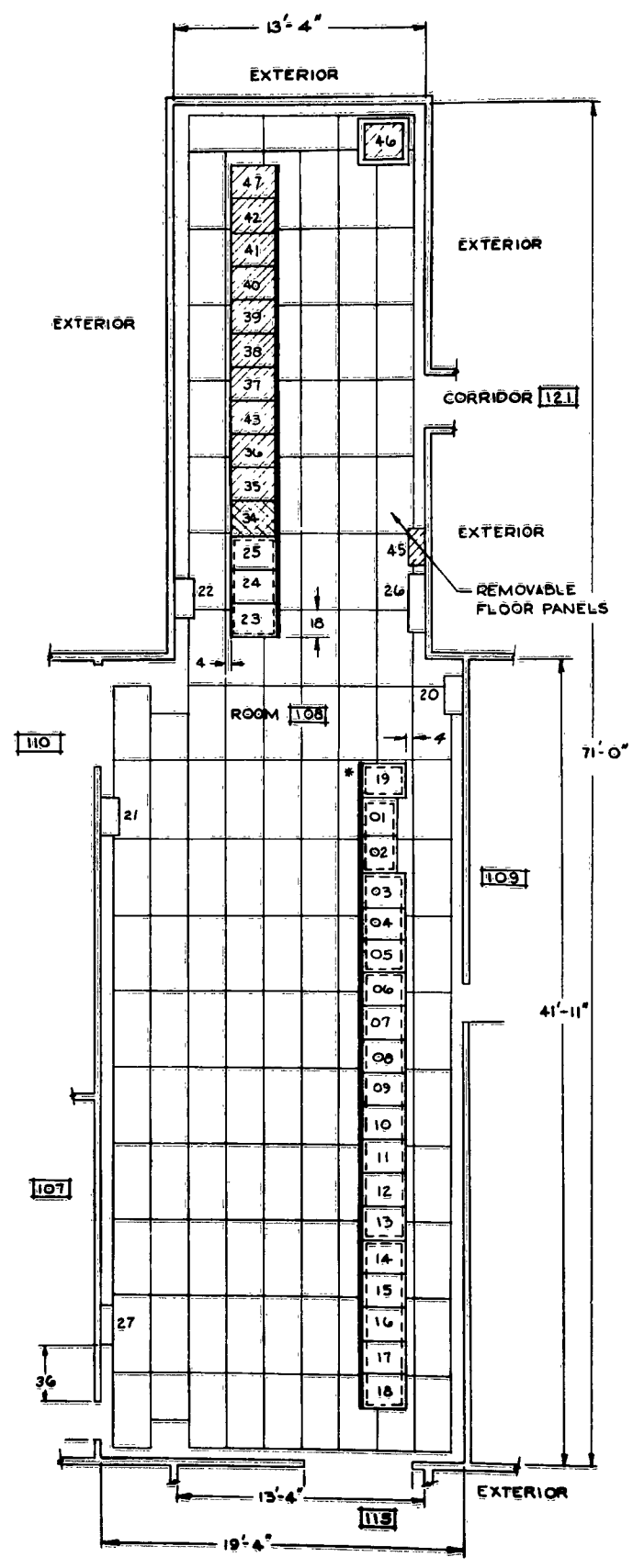
NOTES (UNLESS OTHERWISE SPECIFIED)

Fig. 8-14 Data Processing Equipment Layout, Room 101 (FGS)



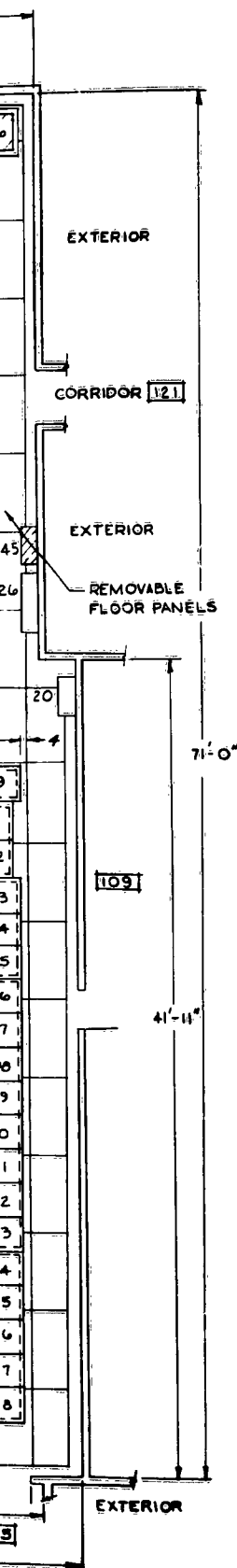
LEGEND

- EXISTING EQUIPMENT
- NEW EQUIPMENT
- RELOCATED EQUIPMENT
- FUTURE EQUIPMENT
- EQUIP. MTD ON PALLET
- OH OVERHEAD MTD EQUIP.

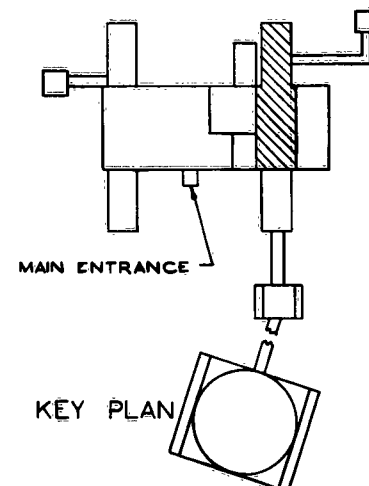


- ⑥ UNIT 17 WILL BE A VHF COMMAND VERB
 - ⑤ UNITS 28 THRU 33
 - ④ UNIT 19 TO BE MODIFIED
 - ③ MOUNT UNIT 44 IN
 - ② RELOCATED FROM 11
 - ① HEAVY LINE DENC
- NOTES (UNLESS)

2



UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
01	RECORDER, TAPE - NO. 1	OA-234	24 x 24 x 73 1/2	MSA
02	RECORDER, TAPE - NO. 2	OA-235	24 x 24 x 73 1/2	
03	RECEIVER - DEGAUSSER EQUIP.	OA-236A	21 x 30 x 82 3/8	
04	RECEIVER & TEST EQUIP.	OA-237A		
05	RECEIVER - STORAGE EQUIP.	OA-238A		
06	RECORDER-MONITOR EQUIP.	OA-239		
07	DETECTOR, LINE DRIVER EQUIP.	OA-240A		
08	COMMUNICATION - PATCH EQUIP.	OA-241		
09	AMPLIFIER & LINE DRIVER EQUIP.	OA-242A		
10	RECORDER-CONTROL EQUIP.	OA-243		
11	ALIGNMENT COMMUNICATIONS EQUIP.	OA-244A		
12	DISCRIMINATORS SUB CARRIER	OA-245A		
13	ALIGNMENT - TEST EQUIP.	OA-246A		
14	DECOMMUTATOR & RECORDER EQUIP.	OA-247A		
15	ALIGNMENT - RECORDER EQUIP.	OA-248A		
16	DECOMMUTATOR & RECORDER EQUIP.	OA-249A		
17	CABINET, ELECTRONIC EQUIP. SPARE	OA-268A		
18	CABINET, ELECTRONIC EQUIP. SPARE	OA-269A		
19	TERMINAL, REMOTE DIGITAL NO. 5	OA-288	21 x 30 x 82 3/8	
20	PANELBOARD, TECH POWER DISTR.	TPP-06		
21	PANELBOARD, TECH POWER DISTR.	TPP-05		
22	PANELBOARD, TECH POWER DISTR.	TPP-14		
23	CONTROL, ANTENNA SERVO	OA-270	21 x 30 x 82 3/8	
24	RECEIVER, VHF AUTOTRACK	OA-271		
25	ALIGNMENT GR, CHECKOUT & CAL	OA-272	21 x 30 x 82 3/8	
26	CABLE TERMINATION CABINET	JD-144	36 x 10 x 48	
27	CABLE TERMINATION CABINET	JD-143	24 x 10 x 30	
28	COMMUNICATION PANEL		19 x 12 x 7	
29				
30				
31				
32				
33	COMMUNICATION PANEL		19 x 12 x 7	MSA
34	CONTROL, ANTENNA	OA-184	21 x 30 x 82 3/8	MSA-B2
35	DOPPLER DATA CONVERTER	U/A		
36	TEST, CHECKOUT & CAL			
37	RECEIVER NO. 1 400 MC			
38	RECEIVER NO. 2 400 MC			
39	MONITOR, 400 MC DOPPLER RCVR			
40	DUPLEXER, RF FILTER ASSY			
41	1 KW POWER AMPLIFIER			
42	15 W TRANSMITTER, EXCITER			
43	400 MC FREQ CONTROL		21 x 30 x 82 3/8	
44	COMMUNICATION PANEL	U/A	19 x 10 x 7	
45	CABLE TERMINATION CABINET	JD-143	24 x 10 x 30	
46	MOBILE TEST CABINET	U/A	24 x 24 x 87	
47	MONITOR, EXCITER	U/A	21 x 30 x 82 3/8	MSA-B2



- ⑥ UNIT 17 WILL BE MODIFIED TO ACCOMMODATE VHF COMMAND VERIFICATION DETECTOR & INDICATOR
- ⑤ UNITS 28 THRU 33 MOUNTED IN UNITS 04, 08, 11, 15, 19 & 23 PER DWG 97-142450
- * ④ UNIT 19 TO BE MODIFIED TO ACCOMMODATE PHASE B2
- ③ MOUNT UNIT 44 IN UNIT 34
- ② RELOCATED FROM INSTRUMENTATION VAN
- 1 HEAVY LINE DENOTES FRONT OF EQUIP.

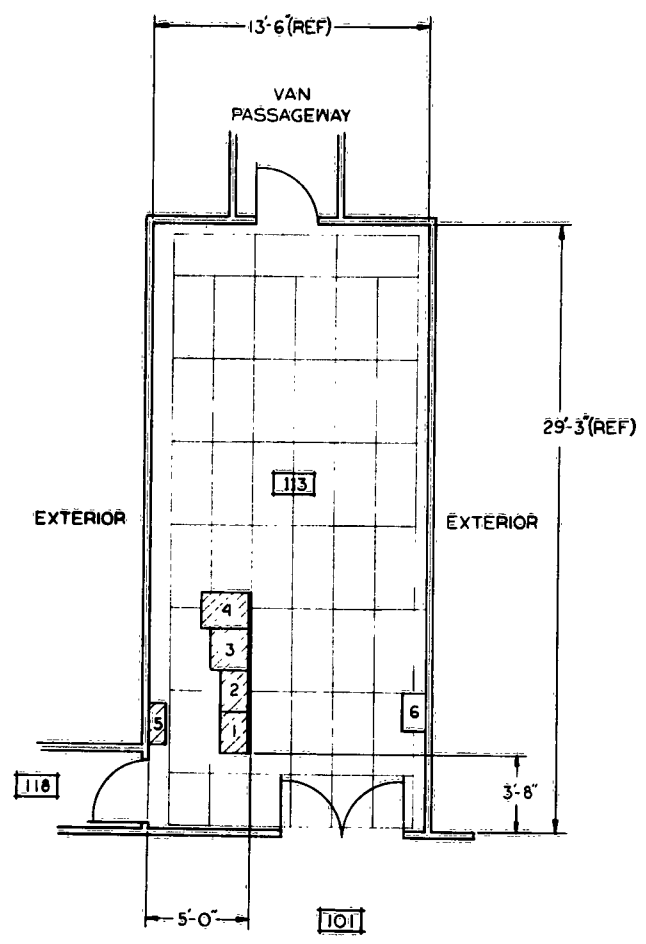
NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-15 TLM Equipment Layout, Room 108



1

UNIT NO.	DESCRIPTION
1	VHF TRAN
2	VHF TRAN
3	ANTENNA C
4	COMMAND (EC
5	CABLE TER
6	POWER P.



LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	RELOCATED EQUIPMENT
	FUTURE EQUIPMENT
	EQUIPMENT ON PALLET
	OVERHEAD MTD EQUIP

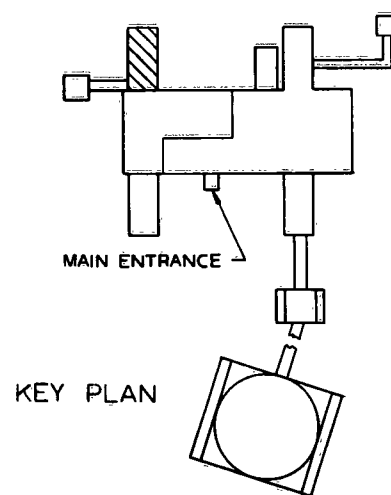
1 HEAVY LINE DENOTES FRONT OF EQUIP
NOTES (UNLESS OTHERWISE SPEC

Fig. 8-

2

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE (W x D x H)	PROGRAM
1	VHF TRANSMITTER		22 x 18 x 67 1/2	MSA-B2
2	VHF TRANSMITTER		22 x 18 x 67 1/2	
3	ANTENNA CONT. & SERVO CAB.		24 x 24 x 83 1/2	
4	COMMAND (ECHO CHECK) & TONE GEN.		21 x 30 x 82 1/2	
5	CABLE TERMINATION CABINET	JD-143	24 x 10 x 30	
6	POWER PANEL	TPP-09	22 x 14 x 30	MSA-B2

29'-3" (REF)

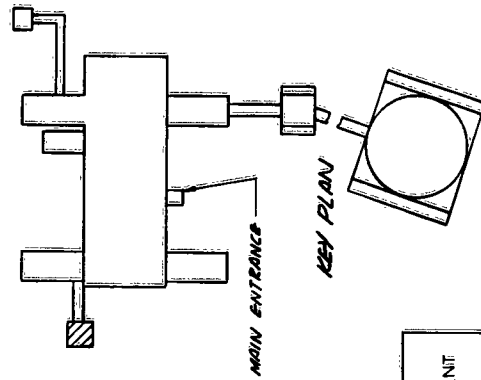
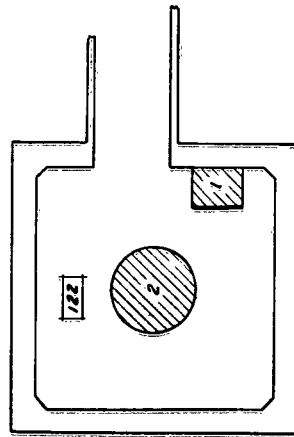


1" SCALE 0 4 8 12 FEET

1 HEAVY LINE DENOTES FRONT OF EQUIPMENT
NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-16 VHF Command Equipment Layout, Room 113 (TTS)

UNIT NO.	DESCRIPTION	MODEL NO.	SIZE	PROGRAM
1	AMPLIFYING		30 x 24 x 42	NSA-82
2	1947 ANTENNA & PEDASTAL			NSA-82



LEGEND	
	EXISTING EQUIPMENT
	NEW EQUIPMENT
	RELOCATED EQUIPMENT
	FUTURE EQUIPMENT
	EQUIPMENT ON PALLET
	OVERHEAD MTD EQUIP.

1. HEAVY LINE DENOTES FRONT OF EQUIPMENT.
NOTES (UNLESS OTHERWISE SPECIFIED):

Fig. 8-17 Motor, Generator, Equipment Layout, Room 122(TTS)

SECTION 9
COMMUNICATIONS REQUIREMENTS PLAN

SECTION 9

COMMUNICATIONS REQUIREMENTS PLAN

9.1 INTRODUCTION

9.1.1 Reason for Submittal

This preliminary communications requirements plan, which defines the communications facilities required to support Phase B-2 of the Multi-Satellite Augmentation Program at FGS and TTS, is a part of the contractor proposed plan for this effort.

9.1.2 Scope

This preliminary communications requirements plan defines the communications subsystem equipment items that are necessary to provide operational and administrative communications facilities to be used in support of MUSAP Phase B-2 at TTS and FGS.

The primary objectives of this plan are to provide a list of the major hardware items, interface definitions, and preliminary schedules for the communications equipment items that must be provided or used to support the program.

9.2 COMMUNICATIONS REQUIREMENTS

9.2.1 General

The following basic communications subsystems will provide support for MUSAP Phase B-2 at FGS and TTS:

1. Interstation Communications Subsystem. This subsystem provides interstation terminal equipment and patching facilities to permit voice, data, and teletype communications.

2. Intrastation Communications Subsystem. This subsystem includes communications equipment which provides administrative telephone, operational voice, public address, air-to-ground radio, and voice recording communications facilities.

9.2.2 Additional Communication Subsystem Requirements

Additional operational voice communications subsystem facilities are required to support the following types of equipment at FGS and TTS during MUSAP Phase B-2:

1. Control console for 60-ft. TT&C antenna (FGS)
2. Quad-helix antenna control rack (TTS)
3. 400-mc Doppler receiving group equipment (FGS and TTS)
4. 375-mc transmitter equipment group (FGS and TTS)
5. 2-kmc track and data receivers (FGS)
6. 200-mc data receivers (FGS)
7. 150-mc command system control (FGS and TTS)
8. 150-mc command system modulator/coder equipment (FGS and TTS).

9.2.3 Equipment Requirements (FGS and TTS)

1. Fort Greeley Tracking Station
 - a. Interstation communications equipment: No additional interstation communications equipment will be required to support MUSAP Phase B-2.

- b. Intrastation communications equipment: With the exception of the operational voice communications equipment listed in Table 9-1, no additional intrastation communications equipment will be required to support MUSAP Phase B-2 at FGS.
- c. It is recommended that the following operational voice communications system equipment items shown in Table 9-1 be provided or used at the indicated locations to support Phase B-2 operations.

TABLE 9-1
OPERATIONAL VOICE COMMUNICATIONS SYSTEM EQUIPMENT (FGS)

ITEM	QUANTITY	DESCRIPTION	EQUIPMENT GROUP	BUILDING
1	1	3-Net. Comm. Panel	Control Console for 60-ft. TT&C Antenna	T&D No. 2
2	1	3-Net. Comm. Panel	400-Mc Doppler Receiving Group	T&D No. 2
3	1	3-Net. Comm. Jackbox	375-Mc Trans. Group	T&D No. 2
4	1	3-Net. Comm. Panel	2-Kmc Track and Data Receivers	T&D No. 2
5 a. b.	1	3-Net. Comm. Panel	200-Mc Data Receivers	a. Phase A FM/FM b. T&D No. 2
6	1	3-Net. Comm. Panel	150-Mc Command System Control Rack	Command Trans. Bldg.
7	1	3-Net. Comm. Jackbox	150-Mc Command System Modulator/Coder Group	C/T Bldg.

- d. The operational voice communications equipment listed in items 2, 3, 6, and 7 of Table 9-1, together with externally located associated 3-network capability intermediate communications equipment for each item, must be procured, installed in the designated operating assembly groups and intermediate communications equipment relay racks, and finally connected into the network central equipment of the MUSAP-Phase A operational voice communications system. A detailed list of the equipment to be procured is included in Para. 9.3, the equipment summary.
- e. The communications panels listed in items 1, 4, and 5b of Table 9-1 currently exist at FGS, but these units are now assigned to and connected to the operational voice communications system for Program 461. In order to use these items in support of Phase B-2 at FGS, it will be necessary to patch three networks of each of these communications panels from their "line-side" appearances on the Program 461 jackfield assembly to the "equipment-side" appearances on the Phase A jackfield. This can be quickly and readily accomplished because of the immediate proximity of the two jackfield assemblies.

2. Thule Tracking Station

- a. Interstation communications equipment: No additional interstation communications equipment will be required to support MUSAP Phase B-2 at TTS.
- b. Intrastation communications equipment: With the exception of the operational voice communications equipment which is listed in Table 9-2, no additional major intrastation communications equipment items will be required to support Phase B-2 operations at TTS.

- c. It is recommended that the following operational voice communications equipment items be provided and used at the locations indicated in Table 9-2 to support Phase B-2 at TTS.

TABLE 9-2

OPERATIONAL VOICE COMMUNICATIONS SYSTEM EQUIPMENT (TTS)

ITEM	QUANTITY	DESCRIPTION	EQUIPMENT GROUP	BUILDING S-1824
1	1	3-Net. Comm. Panel	Quad-Helix Control	Room 108
2	1	3-Net. Comm. Panel	400-Mc Doppler Receiving Group	Room 108
3	1	3-Net. Comm. Panel	375-Mc Trans. Group	Room 108
4	1	3-Net. Comm. Panel	150-Mc Command System Control Rack	Room 113
5	1	3-Net. Comm. Jackbox	150-Mc Command System Modulator/Coder	Room 108

- d. All of the equipment items listed in Table 9-2 can be provided from existing on-site operating assemblies which have been proposed to be deleted during the implementation of the Phase B-2 effort at TTS. Following the relocation of the operational voice communications equipment, it will be necessary to interconnect these items with the network central equipment assembly for the Phase A operational voice communications system.

9.3 EQUIPMENT PROCUREMENT SUMMARY

9.3.1 Fort Greely Tracking Station

Table 9-3 lists the operational voice communications equipment that should be procured for FGS.

TABLE 9-3

OPERATIONAL VOICE COMMUNICATIONS EQUIPMENT PROCUREMENT LIST

ITEM	QUANTITY	DESCRIPTION
1	3	<p>3-Net. access communications panels, each equipped as follows:</p> <p>1 key and lamp circuit (Z option) 1 key and lamp circuit (Y option) 1 dial and buzzer circuit 1 jack and speaker circuit</p> <p>and including:</p> <p>Intermediate communications equipment panel-mounted on relay racks (for each comm. panel):</p> <p>1 PBX line relay circuit 3 network pickup relay circuits 3 speaker pickup relays 1 telephone circuit 1 voice frequency amplifier 1 amplifier circuit 1 PBX line and signalling circuit Flashing and winking circuits for 3-comm. panels.</p>
2	1	<p>3-Net. access communications jackbox equipped with:</p> <p>1 telephone circuit 3 network pickup relays 1 comm. jackbox jk. circuit 1 voice frequency amp.</p>
3	1	Installation hardware kit.

TABLE 9-3 (CONT'D.)

- NOTES:
- Two communications panels and associated intermediate equipment will be located in the T&D No. 2 building.
 - One communications panel, one-comm. jackbox, and associated intermediate equipment items for these units will be located in the command transmitter building.

9.3.2 Thule Tracking Station

No procurement of communications equipment is required.

9.4 SCHEDULES

9.4.1 Fort Greeley Tracking Station

Preliminary information indicates that the communications equipment for FGS can become available FOB at the vendor's 90 days ARO.

9.4.2 Thule Tracking Station

Since all equipment requirements can be provided from existing on-site equipment that is scheduled for deletion during Phase B-2, the Program Plan I&C schedules will determine the availability dates for these items.

SECTION 10

GOVERNMENT FURNISHED PROPERTY AND SERVICES

SECTION 10
GOVERNMENT FURNISHED PROPERTY AND SERVICES

10.1 GOVERNMENT FURNISHED PROPERTY AND SERVICES

10.1.1 Supply

The Government will supply all federally stock numbered items of spare parts and items that the Air Force has indicated assumption of supply support responsibility as GFP. When these spare parts cannot be provided by the Government, the SMAMA detachment may request the contractor to provide them.

10.1.2 Facilities

Maximum utilization of existing facilities at FGS and TTS will be made to support the technical and administrative requirements.

Operation, maintenance, repair and management of the real property facilities will be provided by the 6594th Aerospace Test Wing under the pertinent AFR agreement.

A list of the required test and support equipment that is to be government furnished for this program will be developed and submitted for MUSAP, Phase B-2 upon final determination of the equipment configuration.

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